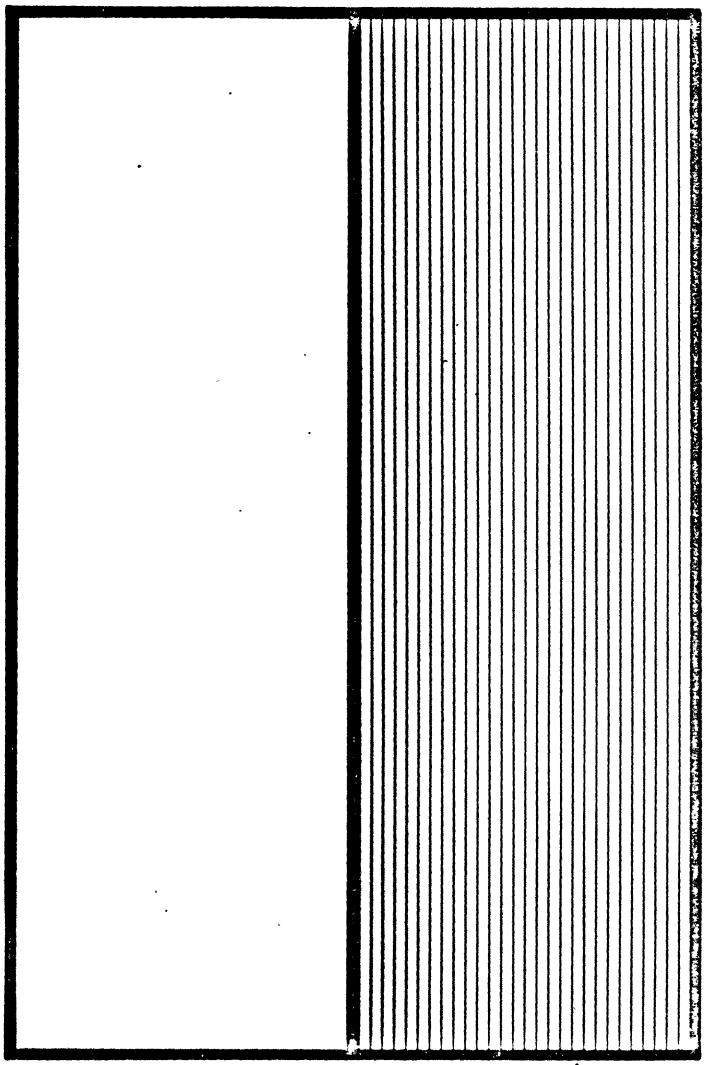
SPERRY RAND

UNIVAC 9400 SYSTEM

PROGRAM DESCRIPTION DRAWING



CUSTOMER ENGINEERING

SPERRY RAND UNIVAC

DRAWING NO. 4091645

REVISION H

CUSTOMER ENGINEERING
PRODUCT DIAGNOSTIC SOFTWARE

9400 - 5017 XII/XVI Mag. Tape Subsystem Test
T5017

	SIGNATURE	TITLE	DATE
APPROVAL			
APPROVAL			
APPROVAL			
APPROVAL			

REVISION STATISTICS RECORD

4091645

DWG REV	MSTR REV	RELEASE DATE	DESIGNER NAME	EIR NUMBER	FCO NUMBER
G	K	9/1/70	S. Evans	C12605	NA
H	N		PDS Phila., Pa.	C12607	

REVISION DESCRIPTION RECORD

4091645

REV	DESCRIPTION
H	Enhance Program Logic

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

1. INTRODUCTION

1.1 Purpose - This document describes the 9400 Maintenance and Acceptance Routine for the UNISERVO XII/XVI Magnetic Tape Subsystem.

1.2 Major Objectives - The objective of this test program is to perform a functional test of the UNISERVO XII/XVI Magnetic Tape Subsystem. Test organization and operator options are intended to satisfy the needs of Design, Quality Control and Field Engineering personnel in checkout, acceptance and maintenance activities.

1.3 Equipment Configurations - All equipment configurations must be connected to the Selector (SLR) I/O channels of the 9400 Processor. This test will operate the following equipment configuration:

- XII/XVI Control/Handler 9-Track Type 5017-00,01
- XII Master Unit 9-Track Type 0861-00,02
- XII Slave Unit 9-Track Type 0861-01,03
- XII Master Unit 7-Track Type 0861-04,06
- XII Slave Unit 7-Track Type 0861-05,07
- W/R, R/R Simultaneity Feature 1600 bpi Phase Type 0861-00,02 Feature F0939-00
- Dual Density 1600 bpi Phase/800 bpi NRZI Type 0861-00,02 Feature F0935-00
- W/R, R/R Simultaneity - 1600 bpi Phase; 800 bpi NRZI - Non-simultaneous type 0861-00,02 Feature F0934-00 and F0935-00
- W/R, R/R Simultaneity - 1600 bpi Phase; 800 bpi NRZI Type 0861-00,02 Feature F0934-00,01, and F0935-00
- W/R, R/R Simultaneity - 200, 556, 800 bpi NRZI Type 0861-04,06 Feature F0934-02
- Capability for 200, 556, 800 bpi NRZI exists if UXII-C-2 Type 0861-05,07 is within the bank.
- XVI 9-Track Type 0862-00,01
- XVI 7-Track Type 0862-02,03
- W/R, R/R Simultaneity Type 0862-00,01 Feature F0936-00
- Dual density - 1600 bpi phase/800 bpi NRZI Type 0862-00,01 Feature F0937-00
- W/R, R/R Simultaneity - 1600 bpi Phase/800 bpi NRZI Type 0862-00,01 Feature F0936-00 and 0937-00
- W/W, W/R, R/W, R/R Simultaneity - 1600 bpi Phase/800 bpi NRZI Type 0862-00,01 Feature F0936-00, 0936-01, 0937-00
- W/R, R/R Simultaneity - 200, 556, 800 bpi NRZI Type 0862-02, 03 Feature F0936-00
- W/W, W/R, R/W, R/R Simultaneity - 200, 556, 800 bpi NRZI Type 0862-02,03 Feature F0936-00, 0936-01

1.4 Associated Software - This program relies on the Maintenance Control Routine (MCR) to perform program load, parameterization, execution, deletion, and I/O handling.

1.5 Reference Documents - Documents used as reference material during the development of this test are as follows:

Drawing	Rev.	Description
S-70040		9400 Processor and Console Product Description
4091622		9400 Maintenance Control Routine
	-	9400 Bootstrap Assembler on 1107/1108
4096482	C	Documentation Standard for Engineering Programming Publications
4096483		General Parameter and Message Standard for Test Programs
4091623		9400 Parameter and Message Routine
4091624		9400 Standard Subroutines
P-10052		VI-C Subsystem (9000 Series) Type 0858-XX
P-10059	A	XII/XVI Subsystem (9000 Series) Type 5017-XX, 086X-XX
MT0858	3	9400 0858 VI-C Magnetic Tape Subsystem Test Program Description Drawing, Revision 3
Memo 12/29/67 H.B. Brown to J.P. Ashbaugh		Simulator and Monitor Mode of Operation (XII/XVI)

2. FUNCTIONAL DESCRIPTION

2.1 Program Philosophy - This test program, which comprises thirteen operator-selectable subtests, is designed to check the system compatibility of a UNISERVO XII/XVI Magnetic Tape Subsystem connected to a UNIVAC 9400 Processor. This program cycles these subtests under various conditions which are selectable by the operator via the parameter entries. All errors detected by the test program will generate an error printout if Variable 1 has not been deleted from the test program. An exception to this rule may occur if running in the Timing Mode.

Once the Control Section of the program is entered it will select a device to test by scanning the device table (TABLEA) until a "find" is made - it has previously been determined that one or more devices exist in the device table. The point at which the scanning begins is the previously updated "find" exit point (initially zero) from the device table. As the control section scans the device table it updates the table after each "find" or "no find" until the last device is reached. The device index is then cleared to enable additional scanning from the start of the table.

Once a device has initially been selected by the control section, it is assigned a subtest which is serially selected from a table (TESTBL) containing all selected subtests. If, however, the only subtest(s) entered requires a 7-Track device (Test 9, 12, or 13) and the selected device lacks a 7-Track head, the control section will delete the device from the device table. A new device will be selected if any more exist, in an attempt to match the 7-Track requirement of Test 9, 12, or 13. If a device is to be assigned Test 13 (by passing the 7-Track check) a check is made to see if the Data Converter feature (F2) exists. Lack of this feature will cause deletion of Test 13 and an attempt to assign the device a new test.

When a device has been assigned a subtest it will perform only those operations unique to that subtest. The device will be assigned a new subtest (or possibly the same subtest) when it has completed all operations contained in its assigned subtest or when end-of-tape is reached. Each time a device is selected it will either perform some type of SIO operation (Read, Write Mode Set, etc.) or simply adjust its block sizes, patterns, modes, or repeat counts. All I/O operations will be performed serially, starting with the lowest numbered device selected.

Each device has its own table containing information which enables the control section to generate various patterns, block sizes, and I/O requests unique to each device. Section 4.2.6 shows the device table format. TABLEA directs the control section to the specific device table.

Tests 9, 12, and 13 will check the special features associated with a 7-Track device. However, all subtests are capable of running on a 7-Track device. If a 7-Track device is encountered while running any subtest other than Test 9, 12, or 13 a Standard Mode Set Command will be issued prior to issuing the selected command. This Standard Mode Set Command will set a condition of 800 bpi, odd parity, Data Translator off, and Data Converter off. If the 7-Track device is assigned either Test 9, 12, or 13, a unique Mode Set Command will be issued prior to issuing the

command. This unique Mode Set Command will set a condition unique to the device and is determined by the present state of its device table. Basic organization of this test program is illustrated in block diagram form in Section 4.2.7.

2.2 Subtest Descriptions - All data patterns issued are shown in Section 4.2.5. Data patterns 9-11 are not issued while running subtests 9, 12, or 13. This prevents the possibility of generating the special 7-Track pattern XXØ11ØØØØ (binary) which would cause a data verification error if read in even parity. This special pattern is issued as Pattern 8 at which time the prggram knows if even parity exists, and if so, what to expect as input. Block size will vary from a maximum of 2Ø48 bytes to a minimum of 12 bytes, (recommended minimum length when reading) in multiples of some predetermined value unless otherwise stated in the test description. The predetermined multiples will vary among the different tests.

2.2.1 Control Unit Test - This test will be in another, separate program.

2.2.2 Test 1 (Group Test) -

Objective and Method - The program executes Tests 1-7.

2.2.3 Test 2 (Write/Read Test) -

Objective - This test checks the basic operating condition of the UNISERVO XII/XVI Subsystem.

Method - The test writes the data pattern FF in numerous 256-byte blocks. The data written is then read (in response to Read Backward commands) and verified.

2.2.4 Test 3 (Write Check Test) -

Objective - This test verifies that the subsystem can execute the Write, Erase, and Write Tape Mark commands.

Method - This test consists of three sections; the write section, which executes the three commands being tested, and the read backward and the read forward sections, which check the execution of the commands. The first section of the test, the write section, executes the following command chain:

1. Write Tape Mark
2. Write one block
3. Erase
4. Write one block
5. Repeat entire sequence.

The other two sections of the test check the Write Command by reading all the data written, first backward then forward. The Backspace File and the Forward Space File commands are used to check the execution of the Write Tape Mark Command. Proper tape position is verified by reading the next block.

The second section of the subtest executes the following command chain:

1. Read Backward -
2. Read Backward
3. Backspace File
4. Repeat entire sequence.

The final section of the test executes the following command chain:

1. Forward Space File
2. Read one block
3. Read one block
4. Repeat entire sequence.

2.2.5 Test 4 (Confidence Test) -

Objective - This test checks the general operating condition of the subsystem.

Method - The test first writes, reads and verifies data blocks; the following command chain is executed:

1. Write one block
2. Read Backward
3. Read forward
4. Write one block
5. Read Backward
6. Read forward
7. Write Tape Mark
8. Repeat entire sequence.

Next the tape is rewound and n Forward Space File commands are executed where n equals the current number of tape marks written by the test on the tape. This action positions the tape just beyond the last tape mark (end of existing data). The last tape mark is then rewritten.

This sequence of writing, reading, rewinding, and forward spacing is repeated (each writing sequence begins just beyond the last test-written tape mark) until the End-of-Tape area is reached. The test is then concluded. The time required to rewind the tape is displayed on the console.

2.2.6 Test 5 (Rewind Test) -

Objective - This test checks the subsystem's rewind function, thus also checking for tape stretching and for excessive rewind timing on a long rewinding operation.

Method - The test writes a series of large blocks of data on the tape, rewinds to the load point, and reads forward to the end of the existing data. Starting at

this point, the test writes another series of large data blocks and continues with the above sequence. This process is repeated until the End-of-Tape marker is reached. The subtest then records the time required to rewind the tape from the End-of-Tape marker to the load point and displays it. The operator should compare this time with the maximum time of 180 seconds required to rewind a full reel (2400 feet) of tape.

2.2.7 Test 6 (Skew Test) -

Objective - This test checks the subsystem for skew problems.

Method - This test operates the subsystem under the conditions most prone to generate a skew condition. A data pattern which gives both 7-Track and 9-Track tapes the formats shown in Figure 1 is written in a series of small blocks followed by many series of increasingly larger blocks until blocks of the largest size allowed by the test program have been written. The subtest then writes more series of blocks which are identical to the previous series except that the first series written is the series of maximum-size blocks and the following series are of gradually decreasing block sizes until the smallest block size is reached. All blocks written are then read both forward and backward.

2.2.8 Test 7 (Loop Drop Test) -

Objective - This test checks the subsystem's loop control system.

Method - The subtest first performs a series of Write and Erase commands. These commands enable the test to attempt the loop drop sequence at increasingly greater positions on the tape.

The test then writes n blocks of data, backspaces n times, and then forward spaces n times. This sequence is repeated with n increasing from 1 in increments of one until n reaches 200. All blocks written are of a fixed length and pattern. Since the main function of the subtest is to check the loop control system, no data is read.

The entire sequence is repeated until the End-of-Tape area is reached.

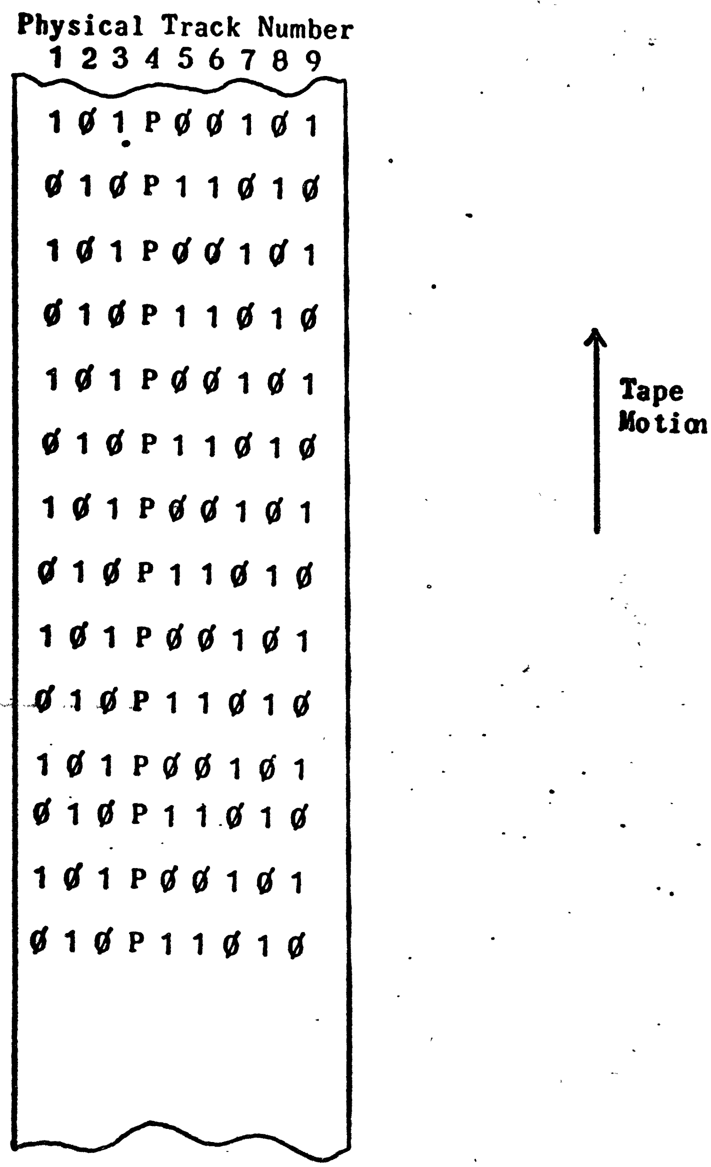
2.2.9 Test 8 (Interchangeability Test) -

Objective - This test verifies that a UNISERVO XII/XVI Tape Handler can read correctly data written by another UNISERVO XII/XVI Tape Handler located on the same subchannel, on a different subchannel, or on a different 9400 System.

Method - The test writes many blocks of data using variable block lengths and all the test patterns included in the test program. The data is read backward to the load point, then forward to the end of the data, and verified. At this point the tape is halted and rewound with interlock. A console message is then displayed as follows:

D hh:mm r T5017 Cn Sn Tn Dn WRITE FIN, SWAP TAPES

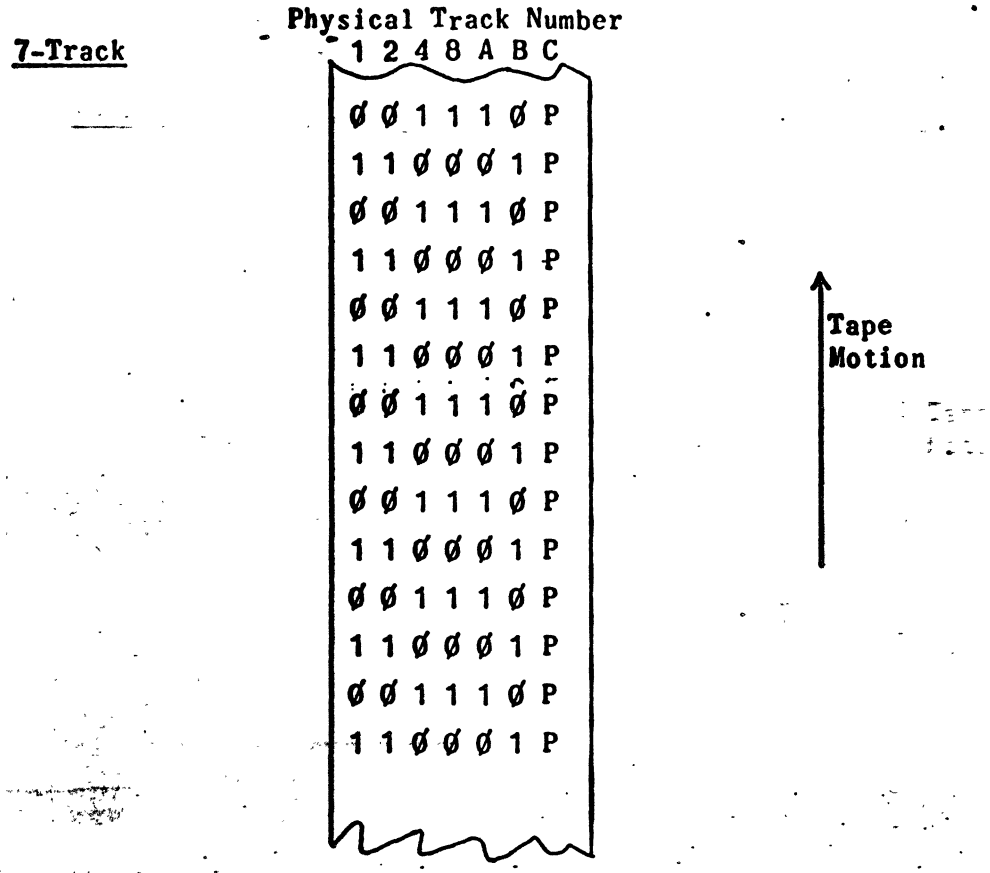
9-Track



P = Parity Track

(byte) 1ØØ111ØØ = 1Ø1PØØ1Ø1 (frame)
(byte) Ø11ØØØ11 = Ø1ØP11Ø1Ø (frame)

Figure 1. Skew Test Tape Format



P = Parity Track

(byte) XXØ111ØØ = ØØ111ØP (frame)

(byte) XX1ØØØ11 = 11ØØØ1P (frame)

Figure 1. Skew Test Tape Format (Continued)

This message indicates that the Write portion of the test is complete. When two or more devices reach this point, the operator should interchange the tapes and enter the proper parameters to resume operation. The test then reads all the data on the swapped tapes both forward and backward and verifies it.

2.2.10 Test 9 (Data Translator Test) -

Objective - This test checks the UNISERVO XII /XVI 7-Track Data Translator.

Method - This test uses the two data conversion tables shown in Figure 3. It writes 66 blocks of length 66 bytes of EBCDIC data with the translator on. The translator is turned off and the tape is read backward to load point, verifying the data using one of the conversion tables. The subtest then writes 66 blocks of length 66 bytes of BCD data with the translator off. The translator is then turned on and the tape is read backward to load point, again verifying the data using the other conversion table in the program. With the translator on, the test writes 66 blocks of 66 bytes of EBCDIC data, then, with the translator left on, reads backward to load point, verifying the data against what was written. Throughout each 66-byte block the mode settings are varied, using those given below.

Density	Parity	Converter	Translator	Mode Set
200	Even	Off	On	00101011
556	Even	Off	On	01101011
800	Even	Off	On	10101011
200	Odd	Off	On	00111011
556	Odd	Off	On	01111011
800	Odd	Off	On	10111011

2.2.11 Test 10 (Illegal Command Code Test) -

Objective - This test verifies that the subsystem rejects all illegal command codes.

Method - All invalid command codes are shown in Figure 2. The test first issues the 199_{10} command codes which are invalid for all UNISERVO XII/XVI Subsystem Configurations. The test then checks to see if the 7-Track Option (Feature 1) has been entered as a parameter. If it has not been entered, the subtest issues the 12_{10} command codes which are invalid for all control units which do not possess this feature. The test then performs the same check on three other options, the Data Conversion Option (Feature 2), the 9-Track 800 bpi NRZI Option (Feature 3) and the Dual Access Control feature (Feature 4), respectively. In each case, if the option is not entered, the subtest issues the commands which are invalid for a control unit which does not possess that feature (3_{10}, 2_{10}, and 2_{10} command codes respectively). Whenever the option for which the test is checking is entered, the test then checks for the next feature. This process is repeated ten times.

After each invalid command code is issued, the test verifies that Bit 6 in the status byte (Unit Check) and Bit 0, Sense Byte 0 (Command Reject) have been set. If they are not, an error message is displayed. If one or both of the control unit

Figure 2. 5017 C.U. TRANSLATE TABLE

COLL. SEQ	EBCDIC GRAPHIC	TRACK/BIT 7 6 5 3 9 1 8 2 0 1 2 3 4 5 6 7	HEX.	HEX.	TRACK/BIT B A 8 4 2 1 2 3 4 5 6 7	BCD GRAPHIC
00	BLANK SP	0 1 0 0 0 0 0 0	40	00 10	0 0 0 0 0 0 0 1 0 0 0 0	BLANK bl SUB. BLK. to - EVEN PARITY ONLY
01	PERIOD .	0 1 0 0 1 0 1 1	4B	3B	1 1 1 0 1 1	PERIOD .
02	LESS-THAN <	0 1 0 0 1 1 0 0	4C	3C	1 1 1 1 0 0	LOZENGE, RIGHT PAREN. ¤,)
03	LEFT PAREN. (	0 1 0 0 1 1 0 1	4D	3D	1 1 1 1 0 1	LEFT BRACKET [,
04	PLUS SIGN +	0 1 0 0 1 1 1 0	4E	3E	1 1 1 1 1 0	LESS-THAN <
05	ABSOLUTE |	0 1 0 0 1 1 1 1	4F	3F	1 1 1 1 1 1	GROUP MARK ǂ
06	AMPERSAND &	0 1 0 1 0 0 0 0	50	30	1 1 0 0 0 0	AMPERSAND, PLUS SIGN &,+
07	DOLLAR SIGN $	0 1 0 1 1 0 1 1	5B	2B	1 0 1 0 1 1	DOLLAR SIGN $
08	ASTERISK *	0 1 0 1 1 1 0 0	5C	2C	1 0 1 1 0 0	ASTERISK *
09	RIGHT PAREN.)	0 1 0 1 1 1 0 1	5D	2D	1 0 1 1 0 1	RIGHT BRACKET]
10	SEMICOLON ;	0 1 0 1 1 1 1 0	5E	2E	1 0 1 1 1 0	SEMICOLON ;
11	LOG. NOT ¬	0 1 0 1 1 1 1 1	5F	2F	1 0 1 1 1 1	MODE CHANGE Δ
12	MINUS SIGN -	0 1 1 0 0 0 0 0	60	20	1 0 0 0 0 0	MINUS SIGN -
13	SLASH /	0 1 1 0 0 0 0 1	61	11	0 1 0 0 0 1	SLASH /
14	COMMA ,	0 1 1 0 1 0 1 1	6B	1B	0 1 1 0 1 1	COMMA ,
15	PERCENT %	0 1 1 0 1 1 0 0	6C	1C	0 1 1 1 0 0	PERCENT, LEFT PAREN. %,(
16	UNDERSCORE _	0 1 1 0 1 1 0 1	6D	1D	0 1 1 1 0 1	WORD SEPARATOR ∨
17	GREATER-THAN >	0 1 1 0 1 1 1 0	6E	1E	0 1 1 1 1 0	BACKSLASH \
18	QUESTION MARK ?	0 1 1 0 1 1 1 1	6F	1F	0 1 1 1 1 1	SEGMENT MARK ⊬
19	COLON : BLANK SP	0 1 1 1 1 0 1 0 0 1 0 0 0 0 0 0	7A 40	10	0 1 0 0 0 0	SUB. BLK. to EVEN PARITY ONLY
20	NUMBER SIGN #	0 1 1 1 1 0 1 1	7B	0B	0 0 1 0 1 1	NUMBER SIGN, EQUAL SIGN #,=

4091645

Figure 2. 5017 C.U. TRANSLATE TABLE (Continued)

COLL. SEQ	EBCDIC GRAPHIC	TRACK/BIT 7 6 5 3 9 1 8 2 / 0 1 2 3 4 5 6 7	HEX.	HEX.	TRACK/BIT B A 8 4 2 1 / 2 3 4 5 6 7	BCD GRAPHIC
21	AT SIGN @	0 1 1 1 1 1 0 0	7C	0C	0 0 1 1 0 0	AT SIGN, PRIME @,'
22	PRIME '	0 1 1 1 1 1 0 1	7D	0D	0 0 1 1 0 1	COLON :
23	EQUAL SIGN =	0 1 1 1 1 1 1 0	7E	0E	0 0 1 1 1 0	GREATER-THAN >
24	QUOTE "	0 1 1 1 1 1 1 1	7F	0F	0 0 1 1 1 1	TAPE MARK (RADICAL) √
25	UNDEFINED	1 1 0 0 0 0 0 0	C0	3A	1 1 1 0 1 0	QUESTION MARK ?
26	A	1 1 0 0 0 0 0 1	C1	31	1 1 0 0 0 1	A
27	B	1 1 0 0 0 0 1 0	C2	32	1 1 0 0 1 0	B
28	C	1 1 0 0 0 0 1 1	C3	33	1 1 0 0 1 1	C
29	D	1 1 0 0 0 1 0 0	C4	34	1 1 0 1 0 0	D
30	E	1 1 0 0 0 1 0 1	C5	35	1 1 0 1 0 1	E
31	F	1 1 0 0 0 1 1 0	C6	36	1 1 0 1 1 0	F
32	G	1 1 0 0 0 1 1 1	C7	37	1 1 0 1 1 1	G
33	H	1 1 0 0 1 0 0 0	C8	38	1 1 1 0 0 0	H
34	I	1 1 0 0 1 0 0 1	C9	39	1 1 1 0 0 1	I
35	UNDEFINED	1 1 0 1 0 0 0 0	D0	2A	1 0 1 0 1 0	EXCLAMATION POINT !
36	J	1 1 0 1 0 0 0 1	D1	21	1 0 0 0 0 1	J
37	K	1 1 0 1 0 0 1 0	D2	22	1 0 0 0 1 0	K
38	L	1 1 0 1 0 0 1 1	D3	23	1 0 0 0 1 1	L
39	M	1 1 0 1 0 1 0 0	D4	24	1 0 0 1 0 0	M
40	N	1 1 0 1 0 1 0 1	D5	25	1 0 0 1 0 1	N
41	O	1 1 0 1 0 1 1 0	D6	26	1 0 0 1 1 0	O
42	P	1 1 0 1 0 1 1 1	D7	27	1 0 0 1 1 1	P

Figure 2. 5017 C.U. TRANSLATE TABLE (Continued)

COLL. SEQ	EBCDIC GRAPHIC	TRACK/BIT 7 6 5 3 9 1 8 2 / 0 1 2 3 4 5 6 7	HEX	HEX	TRACK/BIT B A 8 4 2 1 / 2 3 4 5 6 7	BCD GRAPHIC
43	Q	1 1 0 1 1 0 0 0	D8	28	1 0 1 0 0 0	Q
44	R	1 1 0 1 1 0 0 1	D9	29	1 0 1 0 0 1	R
45	UNDEFINED	1 1 1 0 0 0 0 0	E0	1A	0 1 1 0 1 0	RECORD MARK ǂ
46	S	1 1 1 0 0 0 1 0	E2	12	0 1 0 0 1 0	S
47	T	1 1 1 0 0 0 1 1	E3	13	0 1 0 0 1 1	T
48	U	1 1 1 0 0 1 0 0	E4	14	0 1 0 1 0 0	U
49	V	1 1 1 0 0 1 0 1	E5	15	0 1 0 1 0 1	V
50	W	1 1 1 0 0 1 1 0	E6	16	0 1 0 1 1 0	W
51	X	1 1 1 0 0 1 1 1	E7	17	0 1 0 1 1 1	X
52	Y	1 1 1 0 1 0 0 0	E8	18	0 1 1 0 0 0	Y
53	Z	1 1 1 0 1 0 0 1	E9	19	0 1 1 0 0 1	Z
54	0	1 1 1 1 0 0 0 0	F0	0A	0 0 1 0 1 0	0
55	1	1 1 1 1 0 0 0 1	F1	01	0 0 0 0 0 1	1
56	2	1 1 1 1 0 0 1 0	F2	02	0 0 0 0 1 0	2
57	3	1 1 1 1 0 0 1 1	F3	03	0 0 0 0 1 1	3
58	4	1 1 1 1 0 1 0 0	F4	04	0 0 0 1 0 0	4
59	5	1 1 1 1 0 1 0 1	F5	05	0 0 0 1 0 1	5
60	6	1 1 1 1 0 1 1 0	F6	06	0 0 0 1 1 0	6
61	7	1 1 1 1 0 1 1 1	F7	07	0 0 0 1 1 1	7
62	8	1 1 1 1 1 0 0 0	F8	08	0 0 1 0 0 0	8
63	9	1 1 1 1 1 0 0 1	F9	09	0 0 1 0 0 1	9

Number of Binary Combinations	Bit Positions MSB - - - - - LSB 0 1 2 3 4 5 6 7	Comments
15	0 0 0 1 0 0 0 1 1 1 1 1 0 0 0 1	Invalid for all Control Units { 199 Codes total }
12	0 0 0 1 0 1 0 0 1 1 0 0 0 1 0 0	
1	1 1 1 0 0 1 0 0	
7	0 0 1 0 0 0 1 0 1 1 1 0 0 0 1 0	
7	0 0 1 1 0 0 1 0 1 1 1 1 0 0 1 0	
7	0 0 1 0 1 1 0 0 1 1 1 0 1 1 0 0	
7	0 0 1 1 1 1 0 0 1 1 1 1 1 1 0 0	
8	0 1 X X X 1 1 1	
8	1 0 X X X 1 1 1	
8	1 1 X X X 1 1 1	
1	1 0 0 1 1 0 1 1	
6	1 1 0 1 0 0 1 1 1 1 1 1 1 0 1 1	X = 1 or 0 bits
32	X X X X X 1 0 1	
32	X X X X X 1 1 0	

Figure 3. Invalid Command Codes

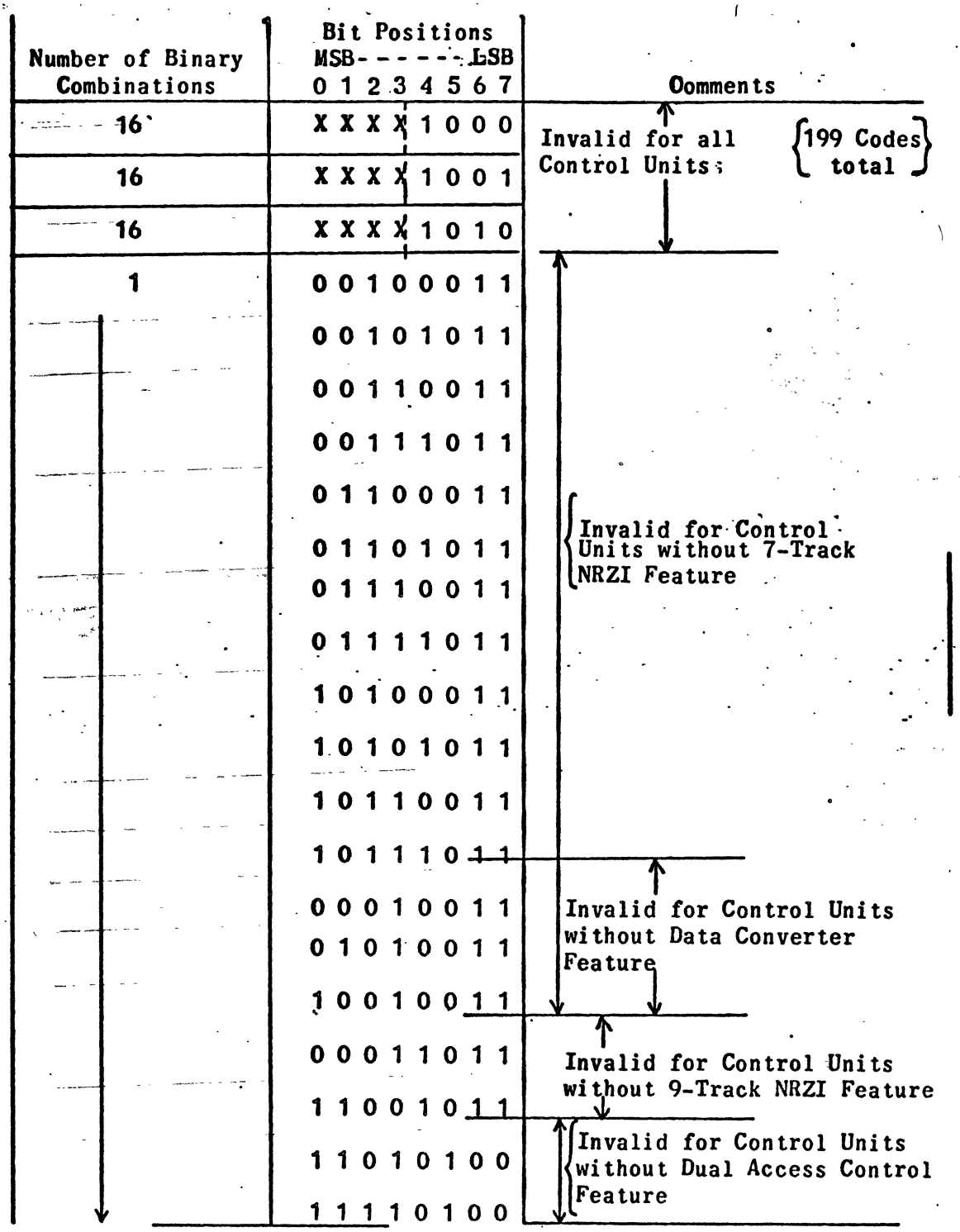


Figure 3. Invalid Command Codes - (Continued)

options do exist within the control unit but were not entered as parameters, the test assumes that the options are not present. The test then issues command codes valid for subsystems possessing this feature and expects to receive the status byte and the sense data indicating an illegal command. When the expected status is not received, an error message is displayed even though the control unit performed properly.

2.2.12 Test 11 (Compatibility Test) -

Objective - This test verifies that the subsystem can read a tape produced on a compatible tape subsystem.

Method - The operator places a tape written by any compatible tape subsystem on the tape unit to be tested. The test sets up a maximum-size buffer, executes Read commands and verifies that normal status is received. The test does not verify the data read.

2.2.13 Test 12 (7-Track Test) -

Objective - This subtest checks the subsystem's 7-Track NRZI feature.

Method - The test writes data blocks using test patterns Ø-8. The test then verifies all data by reading backward to the load point then forward to the end of the data, and comparing all the data read.

During the test, the following Mode Set Commands are used.

Density	Parity	Converter	Translator	Mode Set
2ØØ	Even	Off	Off	ØØ1ØØØ11
556	Even	Off	Off	Ø11ØØØ11
8ØØ	Even	Off	Off	1Ø1ØØØ11
2ØØ	Odd	Off	Off	ØØ11ØØ11
556	Odd	Off	Off	Ø111ØØ11
8ØØ	Odd	Off	Off	1Ø11ØØ11

During all data verification, data bits Ø and 1 will be cleared to zero on the word used to verify the input buffer (it is assumed these same bits are cleared by the hardware on all input data). The bit pattern XXØ1ØØØØ is a special pattern which is written while in even parity and verified by the bit pattern ØØØØØØØØ. No other pattern issues this special bit configuration.

2.2.14 Test 13 (Data Conversion Test) -

Objective - This subtest checks the subsystem's optional Data Conversion feature.

Method - The test writes data blocks using variable block lengths (in multiples of 3 bytes) and test patterns Ø-8. The test verifies all data by reading backward

to the load point, then forward to the end of the data. During this test the following Mode Set Commands are used.

Density	Parity	Converter	Translator	Mode Set
2ØØ	Odd	On	Off	ØØØ1ØØ11
556	Odd	On	Off	Ø1Ø1ØØ11
8ØØ	Odd	On	Off	1ØØ1ØØ11

The number of tape frames recorded in a block will always be a multiple of four.

By writing blocks in multiples of 3 bytes, all tape frames will be in data frames and therefore not padded with zeros. The Data Converter Check in Sense Byte Ø should never be set.

3. OPERATING PROCEDURES

3.1 Initialization - Pre-test setup is as follows:

- Load the Maintenance Control Routine (MCR).
- Mount tapes which contain no permanent data on all the UNISERVO XII/XVI Tape Units to be tested (up to a maximum of 16).

3.2 Program Loading - The procedure for Program Loading is as follows:

- Press ATTENTION Key. The console responds with @, the time, a space, and waits for input.
- Type in RU. The console responds with N and a space.
- Type in T5Ø17 and press the EOM Key. The full statement appears as

  @hh:mm RUN T5Ø17®
- When the program is loaded, the following message is typed on the console:

  JOBj, T5Ø17 LOADED AT (address)
- The program is started as soon as it is loaded. The following message is displayed:

  @hh:mm*Aj T5Ø17 ENTER PARAMETERS.

3.3 Program Modifying - The program operation may be modified by parameter entry at any time.

3.3.1 Parameter Entries - Parameters are entered in a statement with the following general format:

d Cn Fn Vn/y Tn:#Ann Fn®

Where:

d = An Action Designator

Cn = Channel number (n) of the desired Selector I/O Channel.

Fn = A Feature (2 or 4) which applies to the subchannel.

Vn = A Variable (program option).

/y = An extension which applies to Variable 3. It designates the number of times recovery will be attempted by the test program ($1 \leq y \leq 6$). If the extension is omitted, it will be assumed to be three.

Tn = A number or group of numbers indicating subtests.

Ann = A three-character device address consisting of, in order, the alpha character (arbitrarily assigned) which designates the subsystem's control unit, a hexadecimal number (1-F) which is the subchannel address of the control unit, and a hexadecimal number (Ø-F) which specifies a selected device (unit) in the subsystem.

Fn = A Feature (1 or 3) which applies to a device.

® = End-of-Message Symbol.

3.3.2 Parameter Notes and Restrictions -

1. The values of the program variables at load time allow error printout, allow error recovery tries three times, do not cause a Stop-on-Error, allow data verification, and send all error messages to the console.

2. A period(.) is used to separate parameter sentences.

3. A semicolon(;) is used to separate 9-Track and 7-Track Devices within one parameter sentence.

   Example: :#NEØ-2 F1; # NE3-7 F3
   (7-Track) (9-Track NRZI)

4. A colon(:) is used to separate devices from the rest of the parameter statement.

5. In a parameter entry, each three-digit device number (Ann) is preceded by a number sign(#).

6. To change subchannels, the operator deletes all devices on the subchannel presently entered and adds all desired devices on the new subchannel.

   Example: D:#NEØ-4,A:#NAØ-7⊙

7. The test program will not recognize any extension on the Action Designators B(Begin) and V(View).

8. Entering the View designator (V⊙) will display on the console the parameters present in the test program in the following general format.

   Cn Fn, n Vn,n/y Tn:Ann/y,Ann

Where:

- Cn = Present Channel Number
- Fn = Present Feature numbers (1-4)
- Vn = Present Variables
- /y = Present recovery count on Variable 3
- Tn = Present Subtests
- /y = Present state of subtest
  - 4 = Suspended
- Ann = Present devices
- /y = Present option on device
  - 9 = Device has 9-Track NRZI
  - 7 = Device has 7-Track

3.4 Program Stopping - The test program can be stopped by one of the following:

1. A parameter entry having the following format:

   E©

   This entry causes the test program to suspend without a console indication.

2. A parameter entry having the following format:

   D©

   This entry clears all test parameters and causes the test program to suspend itself with the following console indication:

   D hh:mm 1 T5Ø17 LACKS DEVICE

3. Encountering an error with the Stop-on-Error Variable (V4) entered. This entry causes the test program to suspend itself with the following console indication:

   D hh:mm 1 T5Ø17 STOPPED ON ERROR

   The Action Designator E (Suspend) can be applied to specific devices and/or tests as follows:

   E T2:#NEØ© (Suspend Test 2 and Device Ø)
   E T3-5:#NE2-4© (Suspend Tests 3-5 and Devices 2-4)

3.5 Program Starting and Restarting - The test program can be restarted by one of the following:

1. A parameter entry having the following format:

   B©

   This entry restarts the test program from its initial starting point. (This entry must be used to initially start the program.)

2. A parameter entry having the following format:

   R©

   This entry restarts the test program at the point at which it was stopped. It is used when the test program is suspended because of the E© type-in or is stopped on an error (V4 entered).

   The Action Designator R (Resume) can be applied to specific devices and/or tests as follows:

   R T2:#NEØ© (Resume Test 2 and Device Ø)
   R T3-5:#NE2-4© (Resume Tests 3-5 and Devices 2-4)

3.6 Program Termination - The program is removed from storage when a termination directive is submitted to the Maintenance Control Routine (MCR).

3.7 Program Designators - The parameter designators recognized by this test program are grouped into the following three categories.

- Action Designators
- Equipment Designators
- Program Designators

3.7.1 Action Designators - The Action Designators specify how the Parameter Analysis Routine of the test program will process the desired parameters. The following Action Designators are recognized by this test program.

A = Add

B = Begin

D = Delete

E = Suspend

R = Resume

V = View

3.7.2 Equipment Designators - Equipment Designators define the particular UNISERVO VI-C being tested. The following Equipment Designators are recognized by this test program:

Cn = One-digit channel number (1-2) of the UNISERVO XII/XVI Subsystem being tested.

Ann = A three-character device address consisting of, in order, the alpha character (arbitrarily assigned) which designates the subsystem's control unit, a hexadecimal number (1-F) which is the subchannel address of the control unit, and a hexadecimal number (Ø-F) which specifies a selected device (unit) in the subsystem.

Fn = A number (1-4) indicating what features are to apply to the equipment.

Where:

F1 = 7-Track Option applies to the particular device.

F2 = Data Conversion Option applies to the entire channel.

F3 = 8ØØ bpi NRZI Option on device.

F4 = Dual Access Option

3.7.3 Program Designators - Program Designators are parameters which modify the test program testing procedure. The following Program Designators are recognized by this test program.

Tn = A number or group of numbers indicating what subtests are to apply to the subsystem.

Where:

T1 = Group Test

T2 = Write/Read Test

T3 = Write Check Test

T4 = Confidence Test

T5 = Rewind Test

T6 = Skew Test

T7 = Loop Drop Test

T8 = Interchangeability Test

T9 = Data Translator Test

T10 = Illegal Command Code Test

T11 = Compatibility Test

T12 = 7-Track Test

T13 = Data Conversion Test

Vn = A number or group of numbers (1,3,4,7, or 15) indicating what variables are to apply to the subsystem.

Where:

V1 = Allow Error Printouts (available on load). This variable applies to equipment error messages only, not to parameter error or program status messages.

V3/n = Allow Error Recovery n Times (n = 3 at load time.)

V4 = Stop-on-Error

V7 = Direct Error Messages to High Speed Printer

V15 = Delete Data Verification

3.8 Message Descriptions - When the Test Program detects an abnormal condition in the data or in the hardware status or when insufficient parameters are entered, the program informs the operator via a console message. If Variable Seven (V7) is entered and a High Speed Printer is available, the messages are displayed by the printer.

3.8.1 General Format Information - The mnemonics and symbols used in the messages described in 3.8.2 are defined in the following paragraphs.

- Mnemonics

AE = Address Expected

AR = Address Received

BB = Bad Byte

Bn = Block Number
Cn = Channel (n)
CC = Current Command
CS = Current Status
D = Declarative Message
Dn = Device (n)
ES = Expected Status
GB = Good Byte
I = Imperative Message
MB = Monitor Sense Bytes
T5Ø17 = Program Name (Magnetic Tape 5Ø17)
PARAM = Parameter
PN = Pattern Number
PC = Previous Command
PS = Previous Status
Q = Question
SB = Sense Bytes
Sn = Subchannel (n)
TBB = Total Bad Bytes also TBE
TB = Total Byte
TBR = Total Bytes Received
Tn = Test
TN = Track Number

- Symbols

hh = Hour (ØØ-23)
# = Buffer position of data word or byte. The first byte in a buffer is Number 1.
mm = Minute (ØØ-59)
r = Run number (1-8)
n or nn = Numerical value of mnemonic suffix

3.8.2 Messages - Messages originating from the test program fall into three groups: Parameter Error, Subsystem Error, and Information Messages.

3.8.2.1 Parameter Error Messages - Parameter errors result when insufficient

parameters are detected by the test program. The following is a list of all Parameter Error Messages.

1. Lacks Device -

Cause:	Program has no device to test.
Program Action:	Program will wait for more parameters.
Example:	D hh:mm j T5Ø17 LACKS DEVICE
Operator Action:	Enter parameters making certain to enter a device.

2. Lacks Test -

Cause:	When attempting to assign a device a subtest, all subtests are either halted, deleted, or not selected.
Program Action:	Program will wait for more parameters.
Example:	D hh:mm j T5Ø17 LACKS TEST
Operator Action:	Enter parameters making certain to make a test(s) available.

3. Lacks 7-Track -

Cause:	Program has only Tests 9, 12, or 13 to run, and the device selected does not have a 7-Track option.
Program Action:	Program will delete the selected device from its table.
Example:	D hh:mm j T5Ø17 DEVICE Ann DELETED, LACKS 7-TRACK
Operator Action:	If deleted device contains 7-Track re-enter device assigning it 7-Track option. If no 7-Track exists, delete the test in question.

4. Lacks F2 -

Cause:	Test 13 was selected, and Feature 2 (Data Conversion) was not entered.
Program Action:	Program will delete Test 13 from its tables.
Example:	D hh:mm j T5Ø17 TEST 13 DELETED, LACKS F2
Operator Action:	If Data Converter Feature exists, re-enter Test 13 and include Feature 2.

5. Lacks Subchannel (Channel) -

Cause:	The test program was not given a Subchannel (Channel) Assignment.
Program Action:	Program will wait for more parameters.
Example:	D hh:mm j T5Ø17 LACKS SUBCHANNEL (CHANNEL)
Operator Action:	Re-enter parameters making certain to include a Subchannel (Channel) Number.

3.8.2.2 Subsystem Errors - Subsystem errors result when the status byte, device address, or in some cases, sense or monitor sense bytes, do not match the expected bytes. Subsystem errors also result when data being compared does not match, or when the numbers of bytes transferred is incorrect. All subsystem error messages take one of the following formats.

1. Status Error

```
D hh:mm j  T5Ø17 Cn Ann Tn    STATUS ERROR

     PS = nn          PC = nn          SB = nn nn nn nn nn
     CS = nn          CC = nn          MB = nn nn nn nn nn
     ES = nn          PN = n           BN = nnnn TBR = nnnn
```

2. Data Error

```
D hh:mm j  T5Ø17 Cn  Ann Tn   DATA ERROR

     PS = nn          PC = nn          SB = nn nn nn nn nn
     CS = nn          CC = nn          MB = nn nn nn nn nn
     ES = nn          PN = n           BN = nnnn TBR = nnnn
```

3. Transfer Error -(The number of bytes transferred is incorrect)

```
D hh:mm j  T5Ø17 Cn  Ann Tn   TRANSFER ERROR

     PS = nn          PC = nn          SB = nn nn nn nn nn
     CS = nn          CC = nn          MB = nn nn nn nn nn
     ES = nn          PN = n           BN = nnnn TBR = nnnn TB = nnnn
```

4. Device Address Error

```
D hh:mm j  T5Ø17 Cn  Ann Tn   DEVICE ADDRESS ERROR

     PS = nn          PC = nn          SB = nn nn nn nn nn
     CS = nn          CC = nn          MB   nn nn nn nn nn
     ES = nn          PN = n           BN = nnnn TBR = nnnn
     AE = nn          AR = nn
```

3.8.2.3 Information Messages - Information messages result whenever it becomes necessary for the test program to inform the operator of some contingent outcome. The following is a list of all information messages.

1. Test Halted

Cause:	All subtests selected have been suspended by the operator.
Program Action:	Program will wait for more parameters.
Example:	D hh:mm j T5Ø17 ALL TESTS HALTED
Operator Action:	Re-enter parameters making certain to resume one or more subtests.

7. Recovery Error

I hh:mm j T5017 Cn #Ann Tn RCVRY FAILED, TRIED n

3.8.2.3 Information Messages - Information messages result whenever it becomes necessary for the test program to inform the operator of some contingent outcome. The following is a list of all information messages.

1. Test Halted

Cause:	All subtests selected have been suspended by the operator.
Program Action:	Program will wait for more parameters.
Example:	D hh:mm j T5017 ALL TESTS HALTED
Operator Action:	Re-enter parameters making certain to resume one or more subtests.

2. Devices Halted

Cause:	**All devices selected have been suspended by the operator or by the test program.**
Program Action:	Program will wait for more parameters.
Example:	D hh:mm j T5Ø17 ALL DEVICES HALTED
Operator Action:	**At the proper time enter parameters to resume one or more devices.**

3. Enter Parameters

Cause:	**The test program was just loaded by MCR.**
Program Action:	Program will wait for parameters and proceed when it encounters BΦ.
Example:	D hh:mm j T5Ø17 ENTER PARAMETERS
Operator Action:	Enter parameters for the test program.

4. Stop on Error

Cause:	**A subsystem or data error was detected by the test program and the Stop-on-Error Variable (V4) was entered.**
Program Action:	Program will wait for parameters to resume device operation.
Example:	D hh:mm j T5Ø17 STOPPED ON ERROR
Operator Action:	When it has been determined to restart the test, enter the proper parameters to resume operation.

5. Recovery Failed

Cause:	**Device in error was unable to recover from a subsystem error in a previously determined number of recovery attempts.**
Program Action:	Program will type out the number of recovery attempts
Example:	D hh:mm j T5Ø17 Cn Ann Tn RCVRY FAILED, TRIED n
Operator Action:	No operator action required.

6. Swap Tapes

Cause:	**Subtest 8 is being run and the Write portion of the test has been completed by the subchannel and device indicated.**
Program Action:	Program will continue to run the remaining subtests and devices. When tapes have been swapped and the device(s) in question have been resumed, the subtest will read the data on the new tape(s).
Example:	D hh:mm j T5Ø17 Cn Ann Tn WRITE FIN, SWAP TAPES
Operator Action:	Swap the tape(s) in question and enter the proper parameters to resume device operation.

6. Swap Tapes

Cause: Subtest 8 is being run and the Write portion of the test has been completed by the subchannel and device indicated.

Program Action: Program will continue to run the remaining subtests and devices. When tapes have been swapped and the device(s) in question have been resumed, the subtest will read the data on the new tape(s).

Example: D hh:mm j T5017 Cn Ann Tn WRITE FIN, SWAP TAPES

Operation Action: Swap the tape(s) in question and enter the proper parameters to resume device operation.

Example: hh:mm j, R Tn:#Ann. s

7. Test Completed

Cause: The current subtest has cycled thru all scheduled commands and is ready to restart its testing cycle.

Program Action: The subtest will recycle unless halted by operator intervention.

Example: I hh:mm j T5017 Cn #Ann Tn TEST COMPLETED

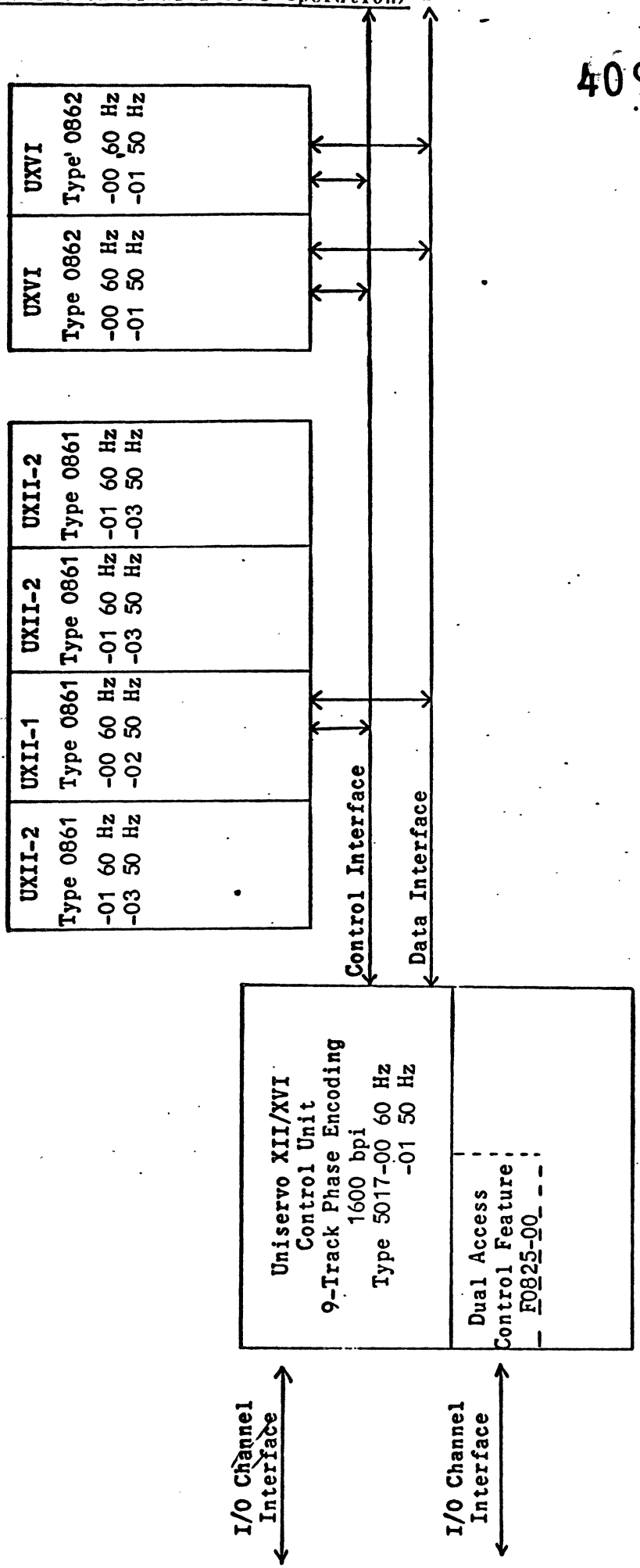
```
PS = nn        DPC = nn        SB = nn nn nn nn
CS = nn        CPC = nn        MB = nn nn nn nn
ES = nn        CC  = nn        BN = nnnn  PN = nnnn  TBE = nnnn
AE = nnnn      AR = nnnn
```

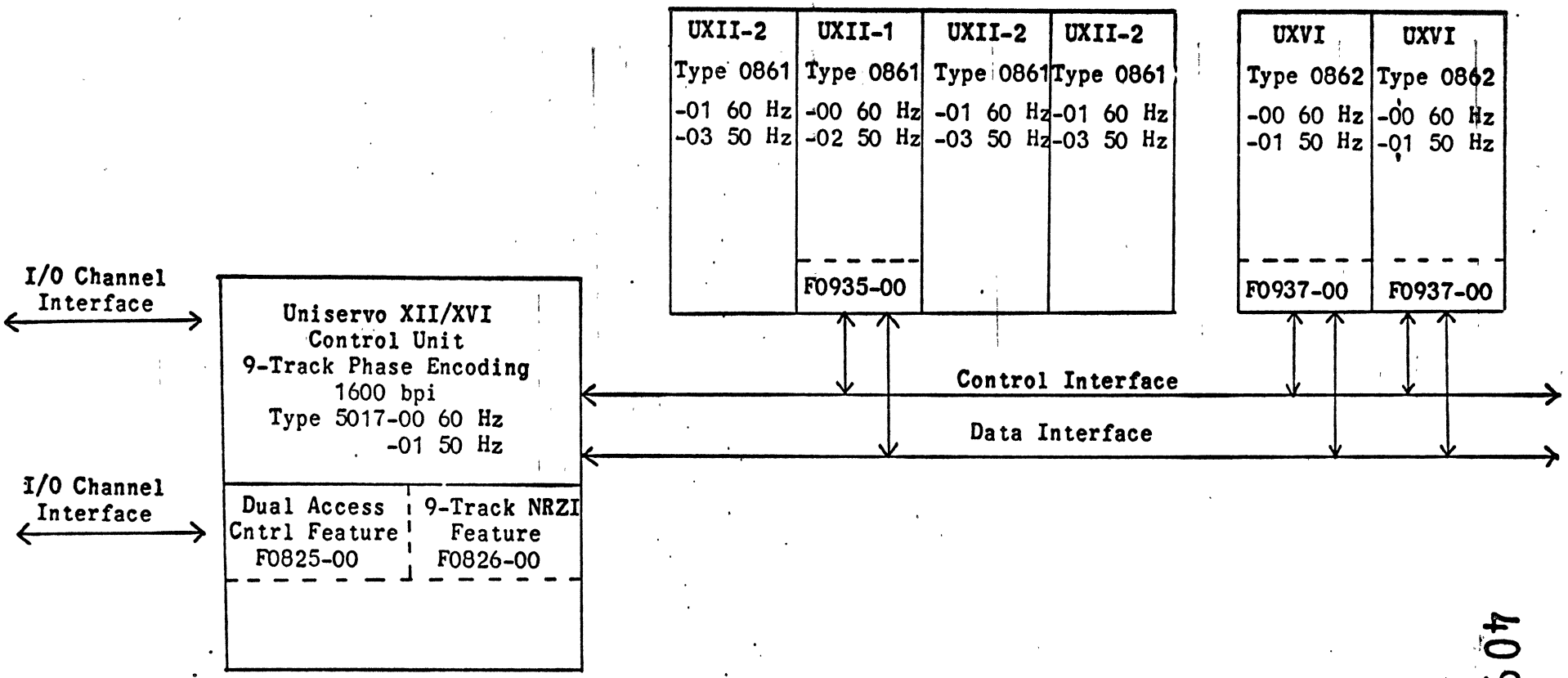
Operator Action: Operator option to cancel test; delete subtest and enter new parameters; or allow the subtest to recycle.

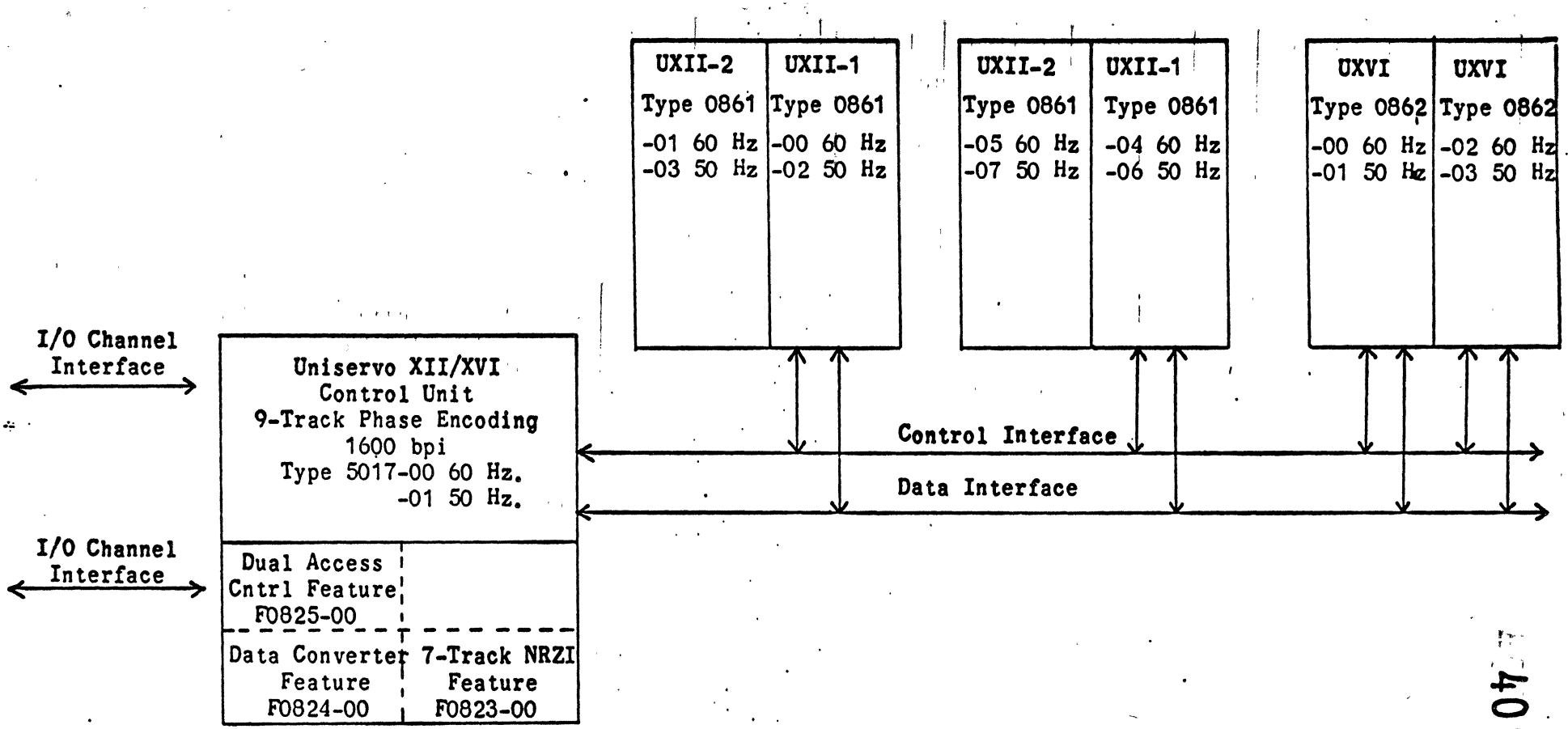
4. SUPPLEMENTARY DATA

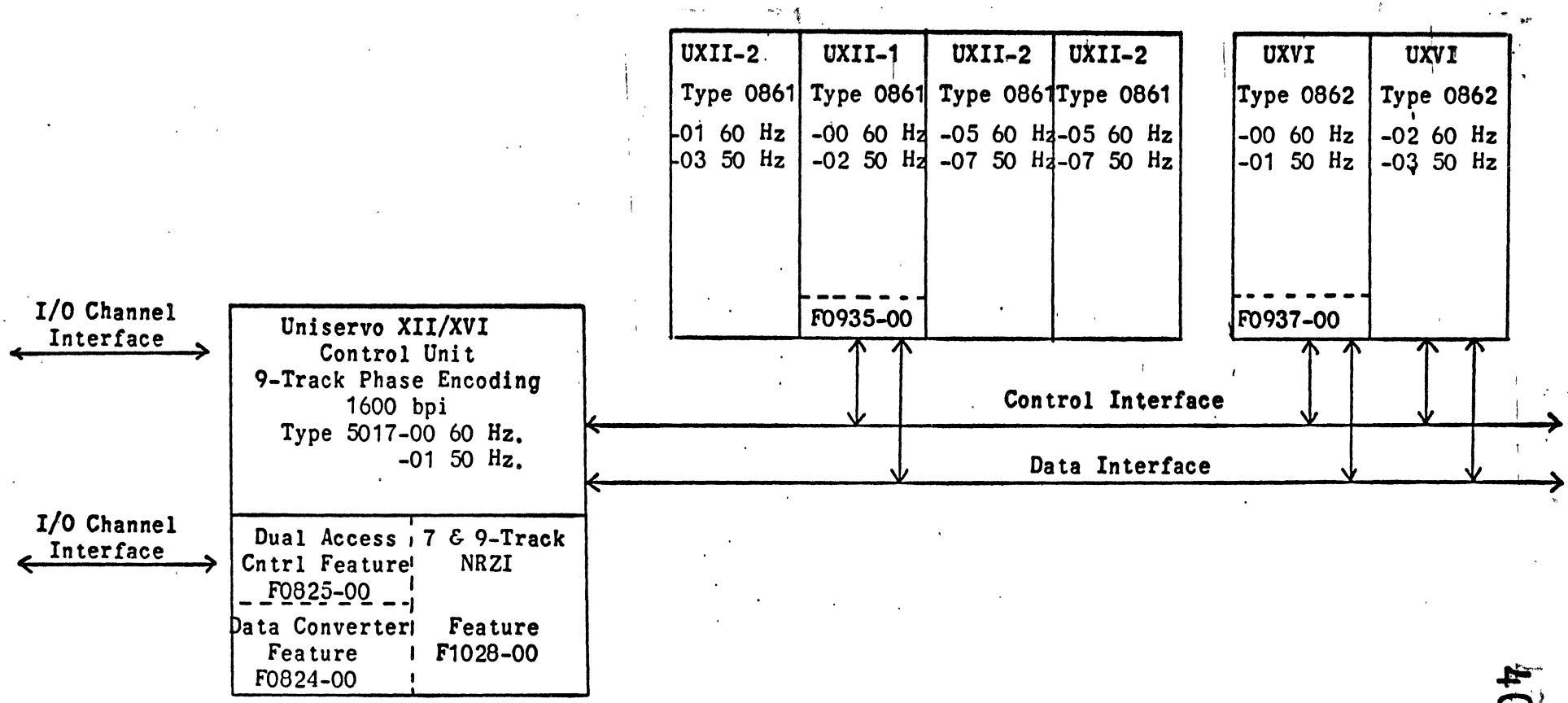
4.1 Supplementary Descriptions -

4.2 Illustrations -


UXVI
Type' 0862
-00 60 Hz
-01 50 Hz
UXVI
Type 0862
-00 60 Hz
-01 50 Hz
UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXII-1
Type 0861
-00 60 Hz
-02 50 Hz
UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
Control Interface
Data Interface
Uniservo XII/XVI
Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz
-01 50 Hz
Dual Access
Control Feature
FD825-00
I/O Channel
Interface
I/O Channel
Interface

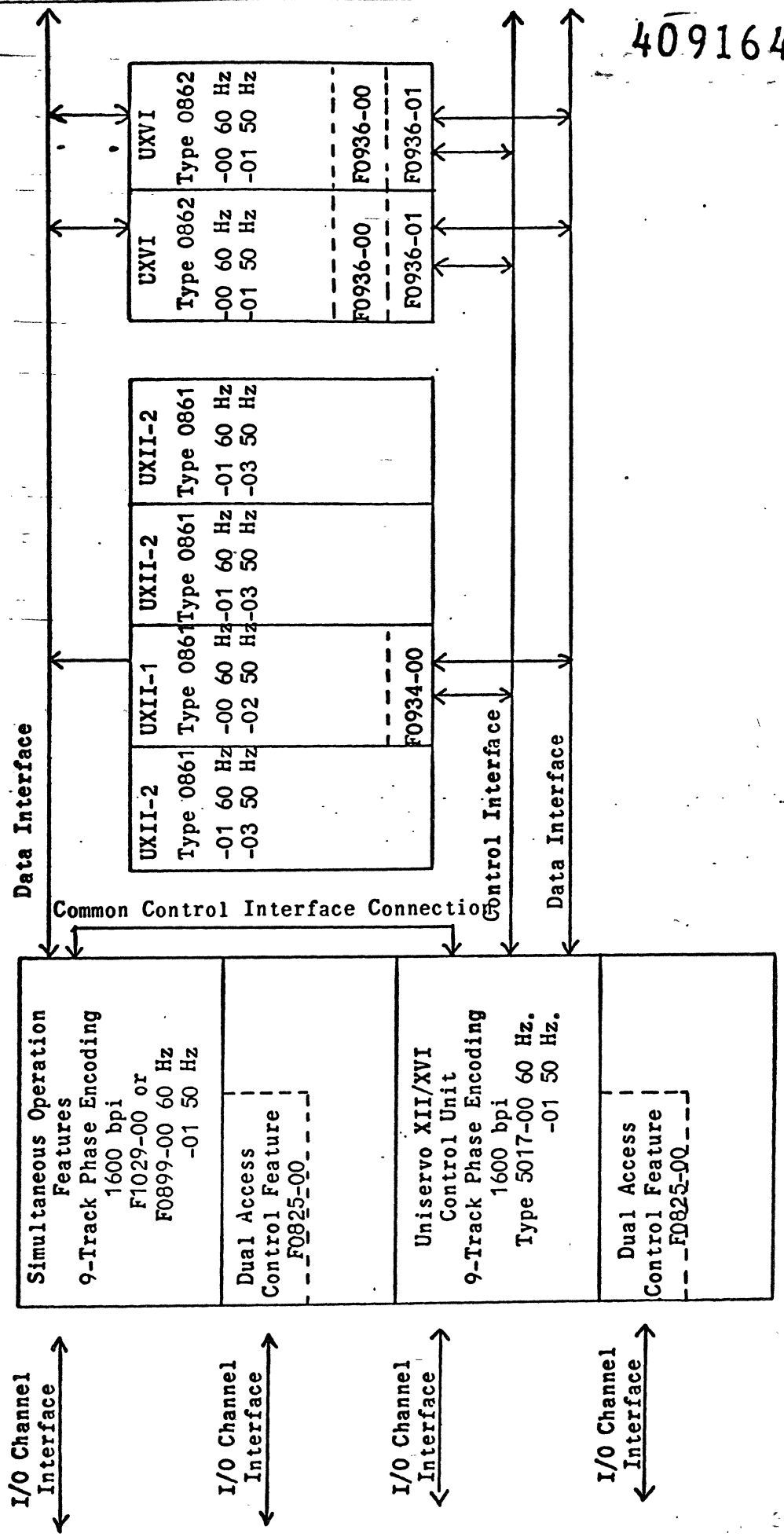

UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXII-1
Type 0861
-00 60 Hz
-02 50 Hz
F0935-00
UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXVI
Type 0862
-00 60 Hz
-01 50 Hz
F0937-00
UXVI
Type 0862
-00 60 Hz
-01 50 Hz
F0937-00
I/O Channel Interface
Uniservo XII/XVI
Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz
-01 50 Hz
Control Interface
Data Interface
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
9-Track NRZI Feature F0826-00

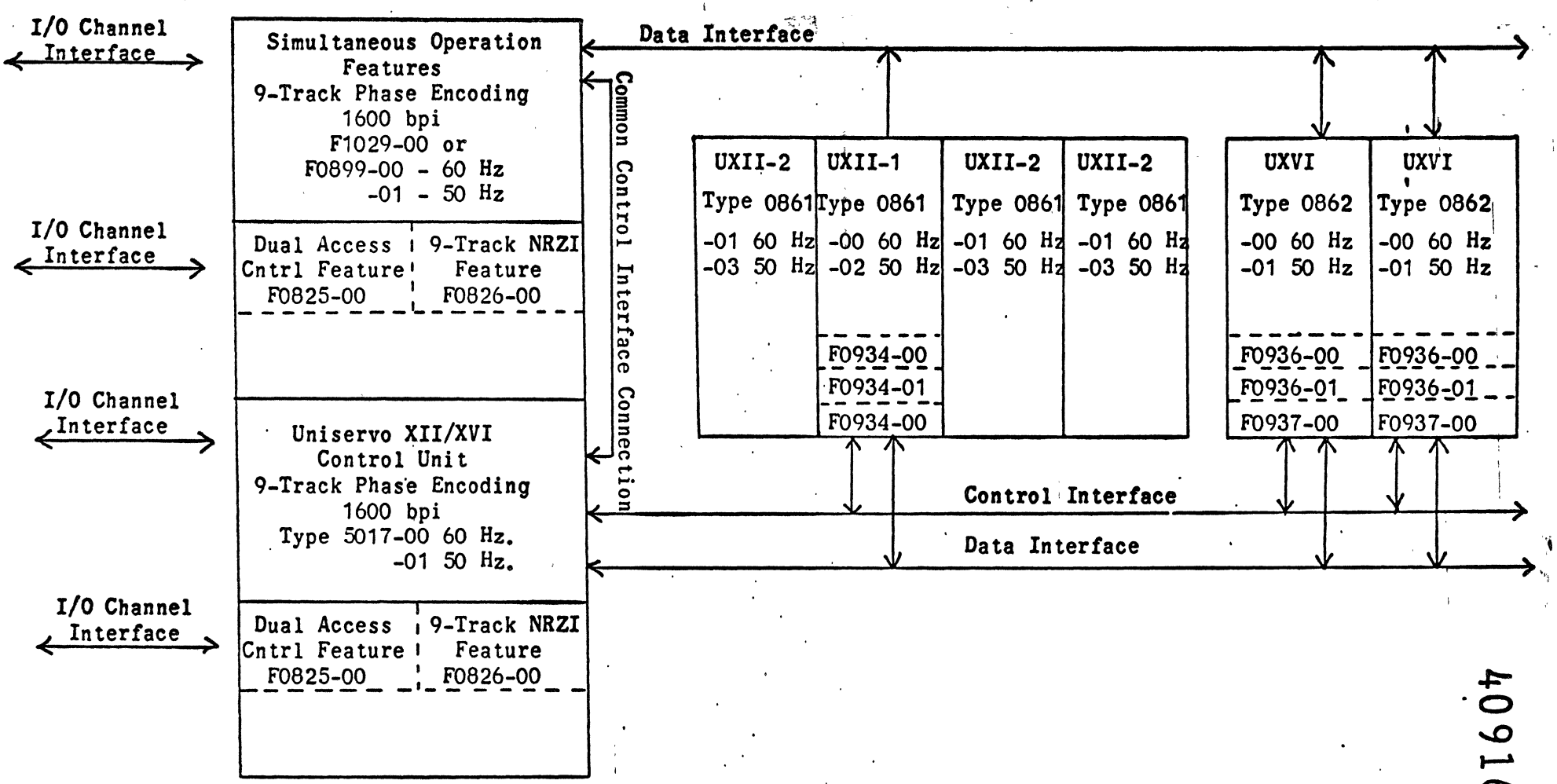

UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXII-1
Type 0861
-00 60 Hz
-02 50 Hz
UXII-2
Type 0861
-05 60 Hz
-07 50 Hz
UXII-1
Type 0861
-04 60 Hz
-06 50 Hz
UXVI
Type 0862
-00 60 Hz
-01 50 Hz
UXVI
Type 0862
-02 60 Hz
-03 50 Hz
I/O Channel Interface
Uniservo XII/XVI
Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz.
-01 50 Hz.
Control Interface
Data Interface
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
Data Converter Feature F0824-00
7-Track NRZI Feature F0823-00


UXII-2
Type 0861
-01 60 Hz
-03 50 Hz
UXII-1
Type 0861
-00 60 Hz
-02 50 Hz
F0935-00
UXII-2
Type 0861
-05 60 Hz
-07 50 Hz
UXII-2
Type 0861
-05 60 Hz
-07 50 Hz
UXVI
Type 0862
-00 60 Hz
-01 50 Hz
F0937-00
UXVI
Type 0862
-02 60 Hz
-03 50 Hz
I/O Channel Interface
Uniservo XII/XVI
Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz.
-01 50 Hz.
Control Interface
Data Interface
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
Data Converter Feature F0824-00
7 & 9-Track NRZI Feature F1028-00

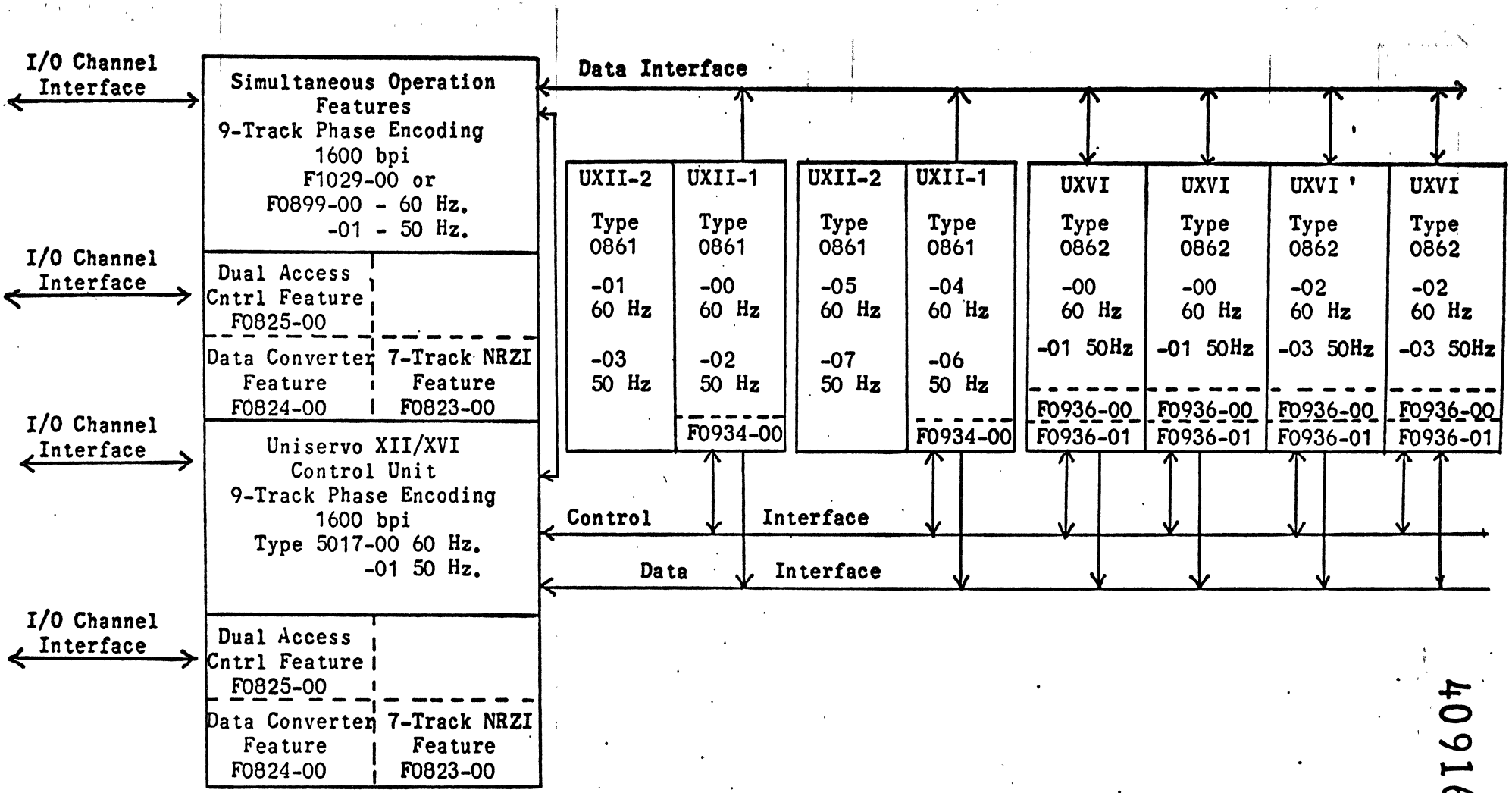
4091645

4.2.2 Configurations (Simultaneous Operation) -

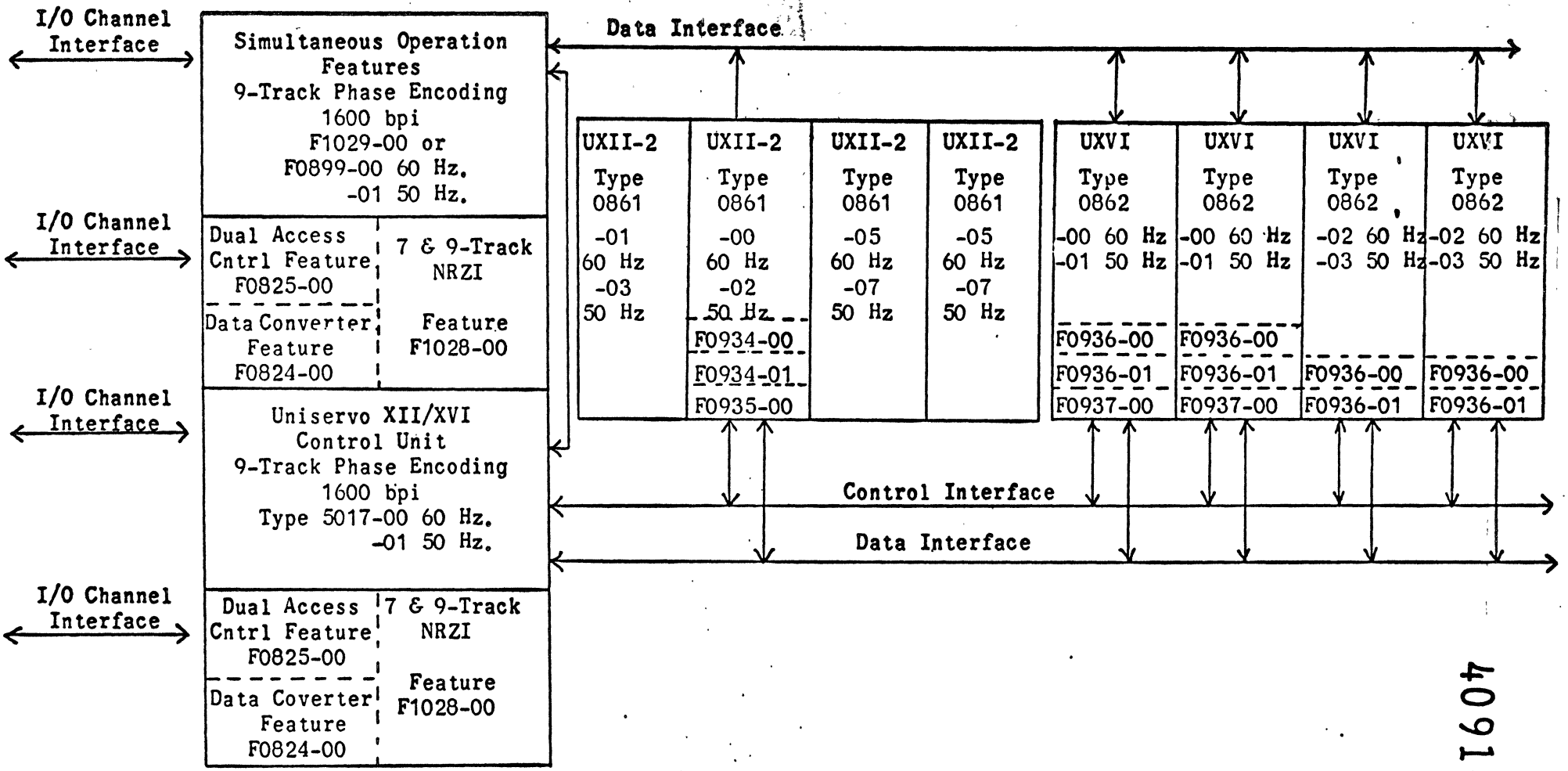



I/O Channel Interface
Simultaneous Operation Features
9-Track Phase Encoding
1600 bpi
F1029-00 or
F0899-00 - 60 Hz
-01 - 50 Hz
Data Interface
Common Control Interface Connection
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
9-Track NRZI Feature F0826-00
UXII-2 Type 0861 -01 60 Hz -03 50 Hz
UXII-1 Type 0861 -00 60 Hz -02 50 Hz
F0934-00
F0934-01
F0934-00
UXII-2 Type 0861 -01 60 Hz -03 50 Hz
UXII-2 Type 0861 -01 60 Hz -03 50 Hz
UXVI Type 0862 -00 60 Hz -01 50 Hz
F0936-00
F0936-01
F0937-00
UXVI Type 0862 -00 60 Hz -01 50 Hz
F0936-00
F0936-01
F0937-00
I/O Channel Interface
Uniservo XII/XVI Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz.
-01 50 Hz.
Control Interface
Data Interface
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
9-Track NRZI Feature F0826-00

4091645


I/O Channel Interface
Simultaneous Operation Features
9-Track Phase Encoding
1600 bpi
F1029-00 or
F0899-00 - 60 Hz.
-01 - 50 Hz.
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
Data Converter Feature F0824-00
7-Track NRZI Feature F0823-00
I/O Channel Interface
Uniservo XII/XVI Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz.
-01 50 Hz.
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
Data Converter Feature F0824-00
7-Track NRZI Feature F0823-00
Data Interface
UXII-2 Type 0861 -01 60 Hz -03 50 Hz
UXII-1 Type 0861 -00 60 Hz -02 50 Hz F0934-00
UXII-2 Type 0861 -05 60 Hz -07 50 Hz
UXII-1 Type 0861 -04 60 Hz -06 50 Hz F0934-00
UXVI Type 0862 -00 60 Hz -01 50Hz F0936-00 F0936-01
UXVI Type 0862 -00 60 Hz -01 50Hz F0936-00 F0936-01
UXVI Type 0862 -02 60 Hz -03 50Hz F0936-00 F0936-01
UXVI Type 0862 -02 60 Hz -03 50Hz F0936-00 F0936-01
Control Interface
Data Interface

4091645


I/O Channel Interface
Simultaneous Operation Features
9-Track Phase Encoding
1600 bpi
F1029-00 or
F0899-00 60 Hz.
-01 50 Hz.
Data Interface
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
Data Converter Feature F0824-00
7 & 9-Track NRZI
Feature F1028-00
UXII-2 Type 0861 -01 60 Hz -03 50 Hz
UXII-2 Type 0861 -00 60 Hz -02 50 Hz
F0934-00
F0934-01
F0935-00
UXII-2 Type 0861 -05 60 Hz -07 50 Hz
UXII-2 Type 0861 -05 60 Hz -07 50 Hz
UXVI Type 0862 -00 60 Hz -01 50 Hz
F0936-00
F0936-01
F0937-00
UXVI Type 0862 -00 60 Hz -01 50 Hz
F0936-00
F0936-01
F0937-00
UXVI Type 0862 -02 60 Hz -03 50 Hz
F0936-00
F0936-01
UXVI Type 0862 -02 60 Hz -03 50 Hz
F0936-00
F0936-01
I/O Channel Interface
Uniservo XII/XVI Control Unit
9-Track Phase Encoding
1600 bpi
Type 5017-00 60 Hz.
-01 50 Hz.
Control Interface
Data Interface
I/O Channel Interface
Dual Access Cntrl Feature F0825-00
Data Coverter Feature F0824-00
7 & 9-Track NRZI
Feature F1028-00

4091645

4.2.3 Function Codes -

Command Code Formats

The Control Unit will respond to the following commands:

Command	0	1	2	3	4	5	6	7
TEST	X	X	0 1	0 1	0	0	0	0
SET INHIBIT STATUS	X	X	0	1	0	0	0	0
RESET INHIBIT STATUS	X	X	1	0	0	0	0	0
SENSE	0	0	0	0	0	1	0	0
SENSE/RESERVE	1	1	1	1	0	1	0	0
SENSE/RELEASE	1	1	0	1	0	1	0	0
WRITE	0	0	0	0	0	0	0	1
READ	0	0	0	I	0	0	1	0
READ BACKWARD	0	0	0	I	1	1	0	0
CONTROL	0	0	1 C	0 C	1 C	1	1	1
MODE SET	D	D	M	M	M	0	1	1

X, I = 1 or Ø bit

CCC	(Control Code)
ØØØ	= REWIND
ØØ1	= REWIND WITH INTERLOCK
Ø1Ø	= ERASE
Ø11	= WRITE TAPE MARK
1ØØ	= BACKSPACE BLOCK
1Ø1	= BACKSPACE FILE
11Ø	= FORWARD SPACE BLOCK
111	= FORWARD SPACE FILE

DD (Density Set)

00 = 200 bpi
01 = 556 bpi
10 = 800 bpi
11 = Set 9-Track Mode

} 7-Track NRZI Operation

MMM (Mode Modifiers; DD = 11 only)

000 = 1600 bpi Phase-Encoding (Reset Condition)
001 = 800 bpi NRZI

NOTE: 9-Track operation overrides but does not reset a 7-Track Mode Setting. 7-Track operation overrides but does not reset a 9-Track Mode Setting. 9-Track operation Mode Settings apply only to WRITE, WRITE TAPE MARK, or ERASE commands executed from load point.

MMM (Mode Modifiers DD ≠ 11)	Set Density	Set Odd Parity	Set Even Parity	Data Converter On	Data Converter Off	Translator On	Translator Off	Request TIE (Track in Error)	Low Gain	
000										NOP (No Operation)
001										Failure-Finding Mode Only
010	x	x		x			x			Reset Condition (Only if Data Converter installed)
011 (DD = 00)								x		9-Track Only
011 (DD = 01)									x	*
100	x		x		x		x			
101	x		x		x	x				
110	x	x			x		x			Reset Condition (If Data Converter not installed)
111	x	x			x	x				

*The low gain condition will apply to the READ or SPACE operation immediately following the MODE SET Command. At the end of the operation, the mode is reset to normal.

X = Condition set or activated by related mode modifier bit configurations.

STATUS AND SENSE DATA

	BIT POSITION	0	1	2	3	4	5	6	7
	STATUS BYTE	ATTENTION	STATUS MODIFIER	CONTROL UNIT END	BUSY	CHANNEL END	DEVICE END	UNIT CHECK	UNIT EXCEPTION
SENSE BYTES	BYTE 0	COMMAND REJECT	INTERVENTION REQUIRED	BUS OUT CHECK	EQUIPMENT CHECK	DATA CHECK	OVERRUN	WORD COUNT ZERO	DATA CONVERTER CHECK
	BYTE 1	NOISE	TAPE UNIT STATUS "A"	TAPE UNIT STATUS "B"	SEVEN TRACK	LOAD POINT	END OF TAPE	FILE PROTECT	TAPE UNIT INCOMPATIBILITY
	BYTE 2	TIE 0	TIE 1	TIE 2	TIE 3	TIE 4	TIE 5	TIE 6	TIE 7
	BYTE 3	R-W VRC R-VRC	MDT LRC	SKEW	POSTAMBLE CK CRC	SDT WVRC	1600 bpi SERVO	BACKWORD	"0"
	BYTE 4	RUNAWAY	TAPE MOTION FAULT	"0"	"0"	"0"	STALL	TAPE FAULT	"0"
MONITOR BYTES	BYTR 0	PROG. COUNT BIT 0	PROG. COUNT BIT 1	PROG. COUNT BIT 2	TAPE UNIT INTERFACE 6AV	7AV	8AV	CHANNEL INTERFACE RESERVED	DEVICE SIMULATION MODE IS SET
	BYTE 1	WRITE	READ	BACKWARD	SPACE	FILE	REWIND	WRITE TAPE MARK	ERASE
	BYTE 2	BACKWARD COMMAND at LP	STOP SENTINEL DETECTED	TAPE MARK DETECTED	INHIBIT STATUS SET	EARLY TERMINATE	PHASE MODE SET	DTP/CYP	DTO/CYO
	BYTE 3	DT1/CY1	DT2/CY2	DT3/CY3	DT4/CY4	DT5/CY5	DT6/CY6	DT7/CY7	PZERP/LP
	BYTE 4	PZER0/L0	PZER1/L1	PZER2/L2	PZER3/L3	PZER4/L4	PZER5/L5	PZER6/L6	PZER7/L7

4.2.4 Status/Sense/Monitor Sense Bytes - (continued)

Status Byte

The Status Byte provides the overall information about status and conditions detected in the operation completed. The Control Unit initiates the sequences to present status to the channel at the end of the Initial Selection Sequence, at the completion of unit selection of a CONTROL operation, and at the completion of the operation. The status bits are reset to binary zero when the status presented is accepted by the channel. The following defines the significance of binary 1 in each status bit.

Bit Designation	Interpretation
0 ATTENTION	The selected tape unit is busy, i.e., ready and rewinding or ready and under control of the other Control Unit. End status will not be presented with this status bit.
1 STATUS MODIFIER	Present with the BUSY Bit to indicate CONTROL UNIT BUSY. On a Control Unit with two I/O Channel Interfaces, CONTROL UNIT BUSY is indicated to one interface if an Initial Selection Sequence is attempted while the Control Unit is presently operating with, or reserved by, the alternate I/O Interface.
2 CONTROL UNIT END	a. When the Control Unit completes a CONTROL operation that kept it busy independently of the channel, during which time it was either addressed (causing a CONTROL UNIT BUSY indication) or an unusual condition was detected (UNIT CHECK or UNIT EXCEPTION), CONTROL UNIT END will be presented with DEVICE END. The Control Unit is considered busy independently of the channel during the interval between the acceptance of the CHANNEL END Status Byte and the DEVICE END Status Byte by the channel. b. Whenever a CONTROL UNIT BUSY sequence occurs on one I/O Interface of a Dual Access Control Unit, and the Control Unit is presently operating with, or reserved by, the alternate I/O Interface, a CONTROL UNIT END Status Byte will be presented to the I/O Interface that received the CONTROL UNIT BUSY indication when the Control Unit completes the operation in progress, or is released by, the alternate I/O Interface.
3 BUSY	a. Present with STATUS MODIFIER to indicate Control Unit busy. b. Present with status already stored if status pending for addressed tape unit, when the command is other than a TEST, SET INHIBIT STATUS OR RESET INHIBIT STATUS.

4 CHANNEL END — For SENSE, REQUEST TIE, WRITE, READ AND READ BACKWARD commands, CHANNEL END is presented with DEVICE END when the operation is completed at the Control Unit level. It is presented on CONTROL commands, after the tape unit is tested and available. If early errors prevent tape motion, and the operation is aborted early, the CHANNEL END Status bit is not sent to the channel. It is also presented at the end of initial selection with DEVICE END on MODE SET commands (except REQUEST TIE).

5 DEVICE END — Indicates that the operation is complete at the Control Unit level. When errors are detected before tape motion is initiated, DEVICE END is not presented with error status. Operations that are aborted when in progress (e.g., Due to Equipment Check) will cause DEVICE END to be sent with UNIT CHECK and CHANNEL END.

6 UNIT CHECK — Indicates:

a. A bit in Sense Byte Ø has been set as a result of the current operation . (If the error condition is detected before tape motion is initiated, UNIT CHECK will be presented without end status.)

b. A READ BACKWARD, BACKSPACE BLOCK, or BACKSPACE FILE is attempted on a tape unit when the tape is positioned at load point. (No end status is presented in this case.)

c. A REWIND WITH INTERLOCK has been completed at the Control Unit level, (i.e., when the tape unit becomes non-ready). If the operation is initiated, DEVICE END will be presented with UNIT CHECK and CONTROL UNIT END.

7 UNIT EXCEPTION — Indicates:

a. A WRITE, WRITE TAPE MARK or ERASE operation is performed in the End-of-Tape area.

b. A tape mark is sensed during a READ, READ BACKWARD, FORWARD SPACE BLOCK, or BACKSPACE BLOCK operation.

In cases a. and b., UNIT EXCEPTION is presented with DEVICE END (and CONTROL UNIT END on CONTROL operations).

Sense Data Bytes

The sense data provides detailed information about the unusual conditions detected in the last operation and the current status of the selected tape unit. Sense bits that set as a result of error or fault conditions during an operation will remain set until cleared upon initiation of a new command. Executing a SENSE Command will not change the state of these bits (all those not marked with an asterisk (*). Bits that are marked with an asterisk will reflect the current state of the selected tape unit. For example, if a Non-Ready condition is detected

and the operation is aborted early, TAPE UNIT STATUS B and INTERVENTION REQUIRED will set in Sense Bytes 1 and Ø respectively. If, between the time that the operation was aborted and the SENSE Command executed, the tape unit became READY, then the sense data returned to the channel will be INTERVENTION REQUIRED and TAPE UNIT STATUS A.

No additional sense information can be set as a result of executing a SENSE Command once the command has been accepted (i.e., Odd Command Byte Parity and Valid Command Code). The following tables describe the significance of the sense bytes.

SENSE BYTE 0		MODE OF OPERATION	
BIT	DESIGNATION	PHASE-ENCODING	NRZI
0	Command Reject	a. Set when a WRITE, WRITE TAPE MARK, or ERASE Command was attempted on a file-protected tape unit. b. Set when an invalid command is transmitted to the Control Unit (see Table - Section 2.4). (This condition will not be set if a BUS OUT Check occurred on a command transfer.) c. The Tape Unit Incompatibility Bit was set (Bit 7, Sense Byte 1).	Same
1	**Intervention Required**	Set whenever Tape Unit Status A is inactive, i.e., a non-existent or non-ready tape unit was selected on other than a SENSE Command. (Bit 1 is not set in Sense Byte 1.)	**Same**
2	**BUS OUT Check**	Set whenever even parity appears on the BUS OUT for data or command transfers. During WRITE operations, if this condition is set on a data transfer, the operation is terminated, and the error byte is not written on the tape. If the error occurs on the first data transfer, Word Count Zero will be set in conjunction with BUS OUT Check.	Same **If this condition is detected during the data transfer on a REQUEST TIE Command, the operation terminates but the information received is ignored. Any TIE information already stored is not disturbed.**
3	**Equipment Check**	**Set Whenever an Equipment Check occurs, i.e., Bits 0, 1, or 5 of Sense Byte 4 have been set.**	
4	**Data Check**	Set whenever a Data Check occurs, i.e., Bit 0 of Sense Byte 1, or Bits 0, 1, 2, 3, 4 of Sense Byte 3 have been set.	Same

BIT	DESIGNATION	PHASE-ENCODING	NRZI
5	Overrun	Set if service is requested on the I/O Interface but data cannot be transferred due to a late SERVICE OUT signal from the channel. If this occurs on the first data transfer of a WRITE operation, Word Count Zero will be sent in conjunction with Overrun.(not set on REQUEST TIE or SENSE Commands).	Same
6	Word Count Zero	a. Set during a WRITE operation if transfer of data is prevented when the first byte of data is requested. This can be due to a COMMAND OUT response to the data byte request, even parity detected for the data byte transfer (see BUS OUT Check), or a channel overload (see Overrun). No new tape motion will occur if any of these conditions are detected. If non-stop operation is indicated, the previous operation will terminate properly. b. Set if the end-of-block is detected on READ or READ BACKWARD operations before any data bytes are recognized (missed start sentinel).	Same
7	Data Converter Check	Not applicable - always set to zero.	See Section 2. Set on 7-Track operations only.

SENSE BYTE 1		MODE OF OPERATION	
BIT	DESIGNATION	PHASE-ENCODING	NRZI
Ø	Noise	When Reading or Read Checking data from Phase-Encoded tapes, the checks performed to set the Noise Bit are essentially the same as in NRZI recording. However, two basic differences pertaining to the quality of the check exist. First, when checking for tape hash, the outputs of the block detector circuits for each track are monitored. Since these circuits tend to reject noise, a single BIT PICK-UP would not activate the block detector outputs and the Noise Bit would not set. In NRZI recording, the Noise Bit would set, since the data lines are monitored directly. Second, when checking for gaps in the data, or data Drop-outs, all block detector outputs must be deactivated together, before the Noise Bit sets. In Phase-Encoded recording, a signal results from writing either a 1-bit or a Ø-bit. Therefore, within the block, a signal is normally present in all tracks. Thus only a relatively serious condition could cause the Noise Bit to set (e.g., a lateral crease in the tape). In NRZI recording, however, a signal is present only when 1-bits are written. Therefore, a small defect in one track, when recording 1-bits only in that track, will cause the Noise Bit to set. The Noise Bit, then, should set relatively infrequently, as compared to the NRZI mode of operation.	a. Tape Hash: During WRITE or WRITE TAPE MARK operations, data (or noise due to tape defects) was detected on Read Check sooner than was expected. During ERASE operations, data (or noise due to tape defects) was detected on Read Check while the tape was being erased. b. During WRITE or WRITE TAPE MARK operations, while Read Checking the recorded data, a gap in the data was detected which was not long enough to set the end-of-block condition. This can occur due to unrecordable areas on the tape. c. During READ, READ BACKWARD, FORWARD SPACE BLOCK, and BACKSPACE BLOCK operations a data Drop-out occurred on READ which was not long enough for the end-of-block condition to be detected. For conditions a, b, and c, above, tape motion does not

<table>
<tr><th>BIT</th><th>DESIGNATION</th><th>PHASE-ENCODING</th><th>NRZI</th></tr>
<tr><td></td><td></td><td></td><td>cease in the middle of the block. Writing (or erasing) will continue to the normal termination point.
d. Bit 6 of Sense Byte 4 was set (Tape Fault).</td></tr>
<tr><td>1*</td><td>Tape Unit Status A</td><td>Selected and Ready</td><td>Same</td></tr>
<tr><td>2*</td><td>Tape Unit Status B</td><td>Not ready, rewinding, or under control of the other Control Unit.
<table>
<tr><th>Status A</th><th>Status B</th><th>Tape Unit Status</th><th>Bit Set in Status Byte</th></tr>
<tr><td>0</td><td>0</td><td>Non-existent</td><td>UNIT CHECK</td></tr>
<tr><td>0</td><td>1</td><td>Not ready</td><td>UNIT CHECK</td></tr>
<tr><td>1</td><td>0</td><td>Ready and not busy.</td><td>———</td></tr>
<tr><td>1</td><td>1</td><td>Ready and busy, i.e., rewinding or under control of other Control Unit.</td><td>ATTENTION</td></tr>
</table></td><td>Same</td></tr>
<tr><td>3*</td><td>7-Track</td><td>Same</td><td>The selected unit has a 7-Track head installed.</td></tr>
<tr><td>4*</td><td>Load Point</td><td>The tape on the selected unit is positioned at load point.</td><td>Same</td></tr>
<tr><td>5*</td><td>End-of-Tape</td><td>The tape on the selected unit is in the end-of-tape area.</td><td>Same</td></tr>
<tr><td>*6</td><td>File Protect</td><td>The tape on the selected unit does not have a write enable ring.</td><td>Same</td></tr>
</table>

BIT	DESIGNATION	PHASE-ENCODING	NRZI
7	Tape Unit Incompatibility	a. Tape Unit is selected on any command requiring tape motion and any of the following conditions occur: Addressed tape unit is a UVI-C or UVIII-C, 7- or 9-Track, and is indicating the phase-encoding mode of operation. Addressed tape unit is a UXII or UXVI, 7-Track, and is indicating the phase-encoding mode of operation. Addressed tape unit is a UXII or UXVI, 9-Track, and failed to reset to 1600 bpi mode. (Load point only.)	Same
		b. Tape unit is selected for a Write-Type operation from load point and the following occurs: Addressed tape unit is UVI-C or UVIII-C, 9-Track type.	b. Tape unit is selected for a Write-Type operation from load point and the following occurs: Addressed tape unit is a UXII or UXVI, 9-Track, and failed to set to 800 bpi mode.
		c. Tape unit is selected for a Read-Type operation from load point and any of the following conditions occur: Addressed tape unit is a UVI-C or UVIII-C, 9-Track, and the tape is written in 1600 bpi phase-encoding mode. Addressed tape unit is a UXII or UXVI, 9-Track, and failed to set to 800 bpi mode when the tape is written in 800 bpi NRZI mode.	Same

SENSE BYTE 2		MODE OF OPERATION	
BIT	DESIGNATION	PHASE-ENCODING	NRZI
0 ↓ 7	Track in Error	Not applicable - Always set to zeros.	This sense byte contains the Track-in-Error Indicator Bits that are set at the end of a READ or READ BACKWARD operation if a Data Check has been encountered. A single 1-bit in any bit position indicates a single-track error, the bit position indicates the track in error. Binary zeros in Bits 0 — 7 implies Bit P. If Bits 6 and 7 contain binary ones, then a multiple track error has been encountered and no track error identification has been made. At the completion of a properly executed READ or READ BACKWARD operation with no Data Check, Sense Byte 2 contains at least Bits 6 and 7 set to 1's. No error correction is attempted when operating with 7-Track tape units. Bits 6 and 7 are set to 1's in Sense Byte 2.

BIT	DESIGNATION	PHASE-ENCODING	NRZI
7	Tape Unit Incompatibility (Continued)	d. A Write-Type operation was attempted on a UNISERVO XII, VI-C, or VIII-C on the second Control Unit (CUB) NOTE: In cases a, b, and d above, no tape motion occurs as a result of the attempted operation. In case c. above, the condition is detected after the first Read-Type operation has been inititated. If the READ-TYPE Command is to be attempted a second time, a REWIND Command should first be executed in order to reposition the tape.	Same

SENSE BYTE 3		MODE OF OPERATION	
BIT	DESIGNATION	PHASE-ENCODING	NRZI
0	R/W VRC	A Vertical Redundancy Check occurred on a data frame when no marginal signal was detected in any track. (uncorrectable).	a. A Vertical Redundancy Check occurred on a data frame or CRC Frame during a READ or READ BACK operation. This indicator is not set after an OVERRUN indication. b. A SPEED CHECK Error occurred during a WRITE or WRITE TAPE MARK operation.
1	Multiple Dead Track Check-Track Start Failure/LRC	a. A marginal signal occurred in more than one track on a READ or READ BACKWARD operation (uncorrectable). b. Valid information was not detected in at least one track while Read Checking the pre-amble during a WRITE operation. This indicates a Track Start failure, possibly indicating the track was never written on the tape. This check is only performed during the pre-amble before the circuits that detect marginal signal are operable. Normally Bit 4 of Sense Byte 3 will set in conjunction with this bit if the track is missing entirely.	A Longitudinal Redundancy Check occurred during a WRITE, WRITE TAPE MARK, READ or READ BACKWARD operation.
2	Skew	Excessive skew is detected during a WRITE, READ or READ BACKWARD operation (deskew register underflow).	Excessive skew detected while read checking recorded data on a WRITE or WRITE TAPE MARK operation.
3	Post-amble Check/CRC	Set when the post-amble following the data is not read correctly.	A Cyclic Redundancy Check occurred during a READ or READ BACKWARD operation (9-Track only).

BIT	DESIGNATION	PHASE-ENCODING	NRZI
4	Dead Track Check/W VRC	a. Indicates at least one track with marginal signal during WRITE or WRITE TAPE MARK operations. b. Indicates a marginal signal in only one track during a READ or READ BACKWARD operation (correctable error). This bit will not be set if a multiple track error occurs (see Bit 1). If I = 1 in the READ Command Code, and this bit is set, Data Check will set. However, if this bit is set and I = 0 in the READ Command Code, Data Check will not set. In either case, the data is correct. c. Indicates that a tape mark was not properly detected on the Read Check of a WRITE TAPE MARK operation.	A Vertical Redundancy Check occurred on a data frame or CRC frame during a WRITE or WRITE TAPE MARK operation.
5*	Tape Unit - 1600 bpi	The selected tape unit is set to 1600 bpi mode.	Same - This bit is always set to zero when selecting a 7-Track tape unit.
6*	Backward	The selected tape unit is conditioned for backward tape motion.	Same
7		NOT USED - Always set to zero.	Same

SENSE BYTE 4		MODE OF OPERATION	
BIT	DESIGNATION	PHASE-ENCODING	NRZI
0	Runaway Check	a. While read checking recorded data during WRITE, or WRITE TAPE MARK operations, the End-of-Block was not detected within at least 8.3 ms (UXII or UVI-C) or 2.9 ms (UXVI or UVIII-C) after writing has ceased. b. During all Read-Type operations, if data is not detected within at least 7.0 seconds (UXII or UVI-C) or 2.5 seconds (UXVI or UVIII-C)	Same
1	Tape Motion Fault	a. Tape unit failed to respond to a START Command. Tape motion may or may not have occurred. b. Tape motion stopped independently of the Control Unit during an operation requiring tape movement. (This condition will be detected if a backward operation is executed into load point.)	Same
2 ↓ 4	These bits are reserved for Failure Finding Mode.	———	———
5	Stall	Indicates that the Control Unit is hung up for more than 2.5 seconds.	Same
6	Tape Fault	During WRITE or WRITE TAPE MARK operations, indicates that the End-of-Block was detected sooner than expect expected. False End-of-Block can occur if a data dropout (all tracks) is longer than 790 μs. on a UXII or UVI-C, or more than 380 μs. on a UXVI or UVIII-C.	Same
7	This bit is reserved for for Failure-Finding Mode.	———	———

4.2.5 Data Patterns -

4091645

	PATTERN CODE	BYTE	SUBROUTINE	HEX CODE
9-TRACK & 7-TRACK	Ø	ØØØØØØØØ	FP	ØØ
	1	11111111	FP	FF
	2	1Ø1Ø1ØØ1	FP	A9
	3	Ø1Ø1Ø11Ø	FP	56
	4	Sliding Ø-Bit	CP	FE
	5	1ØØ111ØØ	FP	9C
	6	Ø11ØØØ11	FP	63
	7	ALTERNATE 5 and 6	COMPL	9C
	8	XXØ1ØØØØ (Special 7-Track)	FP	DØ
7-TRACK	9	Sliding 1-Bit	CP	Ø1
	1Ø	Add and Subtract Binary 1	BINARY 1	ØØ
9-TRACK	11	RANDOM DATA	RP	ØØ

Pattern 12, the data translator pattern, is delineated in Figure 2, Section 2.

4.2.6 Servo Table Format (Servo Ø-15) -

CTN = Ø	Test Number	Current Test Address			
CTEA = 4	Command Table Entry Address				
MLA = 8	Mode Repeat Count	Mode Loop Address			
INTLKF = 12	Interlock Flg	EOT Flag			
EOTF = 13	Rewind Initiate Time				
PLA = 16	Pattern Code	Pattern Loop Address			
BLLA = 2Ø	Block Length Code	Block Length Loop Address			
LAA = 24	Repeat A Count	A Loop Address			
LBA = 28	Repeat B Count	B Loop Address			
EIRA = 32	Recovery Index	EI Return Address			
CBN = 38 BLSCT = 36 FUNTYP = 37	Block Length Factor	Function Type	Current Block Number		
DA = 42 CC = 4Ø PRECMD	Current Command	Previous Command	Device Address		
ADA = 47 TFLAG=44 PHFLG = 45 DEVOPT = 46	Test 9/12/13 Flag	Test 9 Phase Flag	7-Tk Opt.	9-Tk Opt.	Assembled Dev. No.

4.2.7 SERVO Status/Pointer Table (TABLEA)

DEVICE Ø STATUS	DEVICE TABLE Ø ADDRESS
DEVICE 1 STATUS	DEVICE TABLE 1 ADDRESS
DEVICE 2 STATUS	DEVICE TABLE 2 ADDRESS
DEVICE 3 STATUS	DEVICE TABLE 3 ADDRESS
DEVICE 4 STATUS	DEVICE TABLE 4 ADDRESS
DEVICE 5 STATUS	DEVICE TABLE 5 ADDRESS
DEVICE 6 STATUS	DEVICE TABLE 6 ADDRESS
DEVICE 7 STATUS	DEVICE TABLE 7 ADDRESS
DEVICE 8 STATUS	DEVICE TABLE 8 ADDRESS
DEVICE 9 STATUS	DEVICE TABLE 9 ADDRESS
DEVICE 1Ø STATUS	DEVICE TABLE 1Ø ADDRESS
DEVICE 11 STATUS	DEVICE TABLE 11 ADDRESS
DEVICE 12 STATUS	DEVICE TABLE 12 ADDRESS
DEVICE 13 STATUS	DEVICE TABLE 13 ADDRESS
DEVICE 14 STATUS	DEVICE TABLE 14 ADDRESS
DEVICE 15 STATUS	DEVICE TABLE 15 ADDRESS

4.2.8 Register Usage -

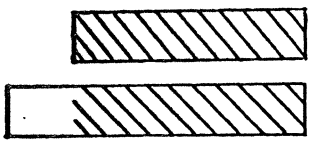
R0 - COMMUNICATION WITH PMR, MCR; VARIABLE
R1 - CCB ADDRESS;VARIABLE
R2 - SECONDARY LINK ADDRESS ON BAL OR BALR
R3 - TABLEA INDEX
R4 -
R5 - } VARIABLE
R6 -
R7 - PRIMARY LINK ADDRESS ON BAL OR BALR
R8 - DEVICE TABLE ADDRESS
R9 - CCB ADDRESS BEFORE
R10 - 4th BASE REGISTER
R11 - CONTAINS A VALUE OF ONE (1)
R12 - CONTAINS A VALUE OF FOUR (4)
R13 - 3rd BASE REGISTER
R14 - 2nd BASE REGISTER
R15 - 1st BASE REGISTER

4.2.9 Simulated Input -

	P 0 1 2 3 4 5 6 7	(9-Track)
Initial CRCR	1 1 Ø Ø 1 1 1 Ø Ø	
Read Out Pattern (D7)	1 1 1 Ø 1 Ø 1 1 1	
Exclusive OR	Ø Ø 1 Ø Ø 1 Ø 1 1	(1st Byte)
CRCR Shifted Right	Ø 1 1 Ø Ø 1 1 1 Ø	
Read Out Pattern (D7)	1 1 1 Ø 1 Ø 1 1 1	
Exclusive OR	1 Ø Ø Ø 1 1 Ø Ø 1	(2nd Byte)
CRCR Shifted Right	Ø Ø 1 1 Ø Ø 1 1 1	
Read Out Pattern (D7)	1 1 1 Ø 1 Ø 1 1 1	
Exclusive OR	1 1 Ø 1 1 Ø Ø Ø Ø	(3rd Byte)
CRCR Shifted Right	1 Ø Ø 1 1 Ø Ø 1 1	
Read Out Pattern (D7)	1 1 1 Ø 1 Ø 1 1 1	
Exclusive OR	Ø 1 1 1 Ø Ø 1 Ø Ø	(4th Byte)

Data Conversion Mode

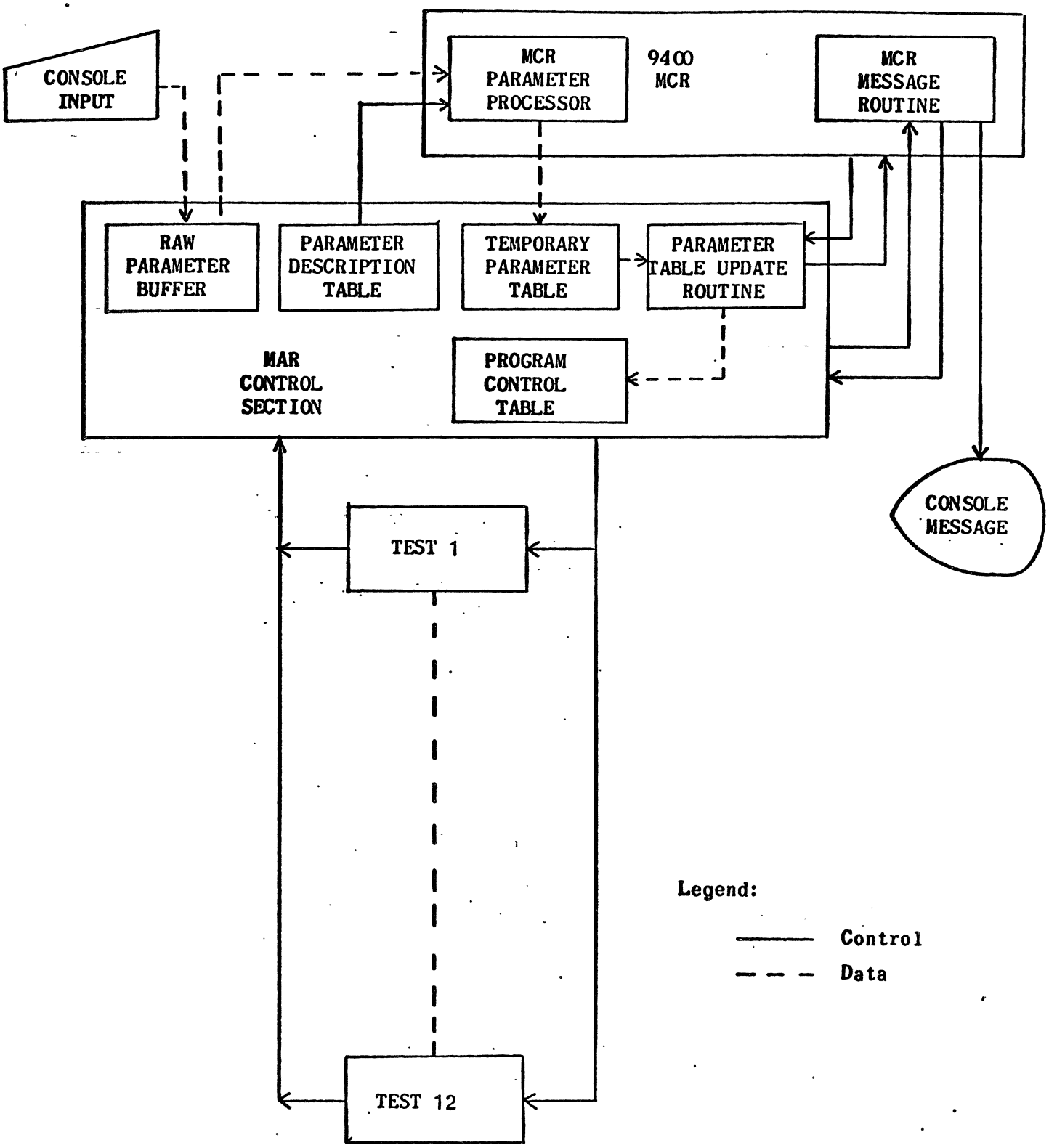
← FRAME 1 →	← FRAME 2 →	← FRAME 3 →	← FRAME 4 →	
2 3 4 5 6 7	2 3 4 5 6 7	2 3 4 5 6 7	2 3 4 5 6 7	(BITS)
Ø Ø 1 Ø 1 1	Ø 1 1 Ø Ø 1	1 1 Ø Ø Ø Ø	1 Ø Ø 1 Ø Ø	DATA
Ø 1 2 3 4 5 6 7	Ø 1 2 3 4 5 6 7	Ø 1 2 3 4 5 6 7	Ø 1 2 3 4 5 6 7	(BITS)
Ø Ø 1 Ø 1 1 Ø 1	1 Ø Ø 1 1 1 Ø Ø	Ø Ø 1 Ø Ø 1 Ø Ø		DATA
← 1st Byte to channel	← 2nd Byte to channel	← 3rd Byte to channel		



7 - Track

9 - Track

4.2.10 UNISERVO XII/XVI TEST BLOCK DIAGRAM -



4.2.11 Control Flow - The Control Section of the test program cycles the selected devices through their assigned subtests. All devices are assigned codes by the Control Section which enables it to know the exact state of all devices in the system. The action taken by the Control Section, on a specific device, depends upon the present code assigned to the device. The following is a list of all possible Device Codes (operational states):

Value of zero (Ø)	The device has not been assigned or has been deleted by the operator.
Value of one (1)	The device has been assigned and is available for testing. Also, the device is not yet set up to perform any I/O operation.
Value of two (2)	The device is set up to issue (receive) some form of I/O operation.
Value of three(3)	The device is rewinding and an interrupt is expected.
Value of four (4)	The device has been halted by the operator or by the test program.
Value of five (5)	The subtest assigned to the device has been halted; consequently, the device has also been halted.

During the selection of the subtest, the Control Section uses the following codes to determine its future course of action:

Value of zero (0)	The subtest has not been selected or has been deleted by the operator.
Value of one (1)	The subtest has been selected.
Value of four (4)	The subtest has been halted by the operator.